ASSET-BACKED SECURITIES: THE DETERMINANTS OF YIELD SPREADS

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Asset-backed securitization has enjoyed rapid growth in its rather short existence as a public market. These nonmortgage, nongovernment-guaranteed asset-backed issues have created a new source of fixed income securities for investors and a new source of liquidity for banks and other lending firms. This study examines the determinants of asset-backed securities' (ABS) equilibrium yield spread over Treasury, using a cross-section of primary market issue prices.

The process of converting illiquid assets to traded securities involves a complex set of institutional arrangements and structures that create an intricate set of risks for the investor. These institutional arrangements, structures, and risks are analyzed as a precursor for specifying a model of the determinants of pricing. This model extends

models previously used in pricing studies of corporate bonds and mortgage-backed securities.

There is no standard data source for these securities, so there have been no previous studies of how these securities are priced. A major contribution of the study is the assembly and analysis of a substantial dataset that describes the pricing and characteristics of over 700 ABS at issue. Ordinary least square regressions are utilized in the pricing analysis, which includes issues from 1985 through 1992. This analysis finds that ABS pricing (absolute and relative yield spreads) is rational and prices reflect premiums for default risk, interest rate and reinvestment risk, and marketability. As one would expect in a rapidly evolving market, institutional forms have changed frequently, and new ones have been added, over the sample period. To some degree, the market has required premiums for the unfamiliar or new and discounted for experience. ABS in general do not exhibit negative convexity and are not subject to excessive prepayment risk. Although the complicated structures utilized to separate the risk of the collateral from the risk of the originator are effective, as indicated by the preponderance of AAA rated issues, investors nonetheless require information in addition to credit rating concerning an issue's pool and/or servicing when pricing the issue.

CHAPTER 1
INTRODUCTION

The significant growth of asset securitization by banks and other lenders via nonmortgage, nongovernment-guaranteed asset-backed security issues has created a new source of fixed income securities for investors and a new source of liquidity for banks and other lending firms. While it has been suggested that asset-backed securities are technically superior to traditional on-balance sheet means of financing because of potentially lower costs and more efficient risk allocation, there has been no systematic evaluation of how investors price these securities. This study examines the determinants of asset-backed securities' equilibrium yield spread over Treasury, using a cross-section of primary market issue prices.

The asset-backed security (ABS) market, in existence just since 1985, has rapidly grown to over $60 billion of new issues a year. The process of converting illiquid assets to traded securities involves a complex set of institutional arrangements and structures (described in Chapter 2) that creates an intricate set of risks for the investor. There is no standard data source for these securities, so there have been no studies of how these securities are priced. A major contribution of the study is the assembly and analysis of a substantial dataset that describes the pricing and characteristics of over 700 ABSs at issue. This study offers the opportunity to analyze a new market and characterize the market maturation process. It investigates the sensitivity of these asset-backed securities

to prepayment risk--do they exhibit sensitivity like mortgage-backed securities or exhibit positive convexity like noncallable corporate bonds. It also analyzes the sufficiency of credit rating to characterize credit quality in a heterogeneous market. Investors may utilize other information in addition to credit rating, such as originator characteristics and credit enhancement amount and type. If investors do use originator rating, the market may not believe the claims of a "bankruptcy remote" legal structure.[1] Finally, the study assesses whether standard proxies for marketability, default risk, and interest rate risk are priced in this new market.

Securitization refers to the transformation of private loans negotiated between a borrower and a lender into publicly traded (or at least saleable) securities. It separates the originator from the ultimate investor. It is reflected by two streams: loan sales (confined to banking) and the more narrowly defined (but more broadly practiced) securitization, credit securitization or the issuing of asset-backed securities.[2] Credit securitization differs from single loan sales because it involves the pooling of assets--such as mortgages, automobile loans, or credit card receivables--and the creation and sale of

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[1]In the securitization process, a "bankruptcy remote" special purpose vehicle or entity (SPV/SPE) is established to separate the risks of the pool of collateral from the originator. The SPV is a specially chartered corporation that purchases the loans (collateral) from the originator and is the actual issuer of the securities. Thus there is no liability created on the balance sheet of the originator. For banks, the "bankruptcy remote" terminology is not exactly correct, since banks cannot go bankrupt; rather, they can be declared insolvent. If this separation of the originator from the issuer were not complete, it would imply an off-balance sheet liability for a bank.

[2]Some authors would not include loan sales under the rubric of securitization. Greenbaum and Thakor (1987) sharply distinguish between the two: "[S]ecuritization involves qualitative asset transformation. . . . Thus, securitization enhances liquidity, reduces credit risk and restructures cash flows. Loan sales merely separate funding from origination." (p. 380).

new securities collateralized by the pool of assets. Mortgage-backed securities usually have an explicit or implicit guarantee from a U.S. government agency and are not the concern of this study. Asset-backed securities with other types of collateral are addressed here. These securities are usually rated triple A, a rating attained by the addition of some sort of credit enhancement.[3] Securitization transfers risk from the originator and often restructures risk bearing to some degree.

The rapid growth of securitization over a relatively short time indicates that the process has become an important tool for banks and other firms and an important subject of study.[4] The first nonmortgage backed, nongovernment-guaranteed, publicly issued asset-backed security was introduced in March of 1985 by Sperry Corporation, a $192.5

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[3]Credit enhancement refers to any additional protections for investors against default risk that are included in the structure of the issue. These include guarantees of principal and interest payments by third party insurers, senior/subordinate structures, and cash collateral accounts which are a stated percentage of principal maintained as a separate account as a first loss protection for investors.

[4]Asset securitization is used by many types of firms to reduce leverage, to diversify funding, and, especially for lower rated originators, to raise less expensive funds. Asset securitization is used by banks in fund raising, in asset-liability management, in meeting customer demand, and in avoiding regulatory taxes (reserve requirements and deposit insurance premiums on funding deposits, and regulatory capital requirements). Borrowers benefit through an increased supply of loans, potentially lower costs, and increased credit on terms lenders might not provide to such a degree otherwise, such as fixed rate mortgages. Investors have a greater supply and variety of investment opportunities suited to specific needs. The banking system arguably has been made more stable through an increase in liquidity for previously nonmarketable assets, through increased opportunities for diversification, and because of an increased ability to compete for borrowers. The overall economic system benefits through more optimal risk bearing. In fact, Roll (1987) points to financial innovations such as collateralized mortgage obligations as helping to "complete the market" and thus creating value (through lower required yields on the underlying mortgages). Jameson, Dewan, and Sirmans (1992) attempt to measure the welfare benefits of CMOs and find them to be substantial.

million issue backed by computer lease receivables.[5] Yet in a short time the market for these securities has grown dramatically. New issues for 1993 were just over $60 billion. New issues for 1994 are expected to total between $62 billion and $70 billion, rising from $1.23 billion in 1985.[6]

The growth in securitization is likely to continue, spurred by some recent regulatory and legislative events. First, in November, 1992, the SEC passed Rule 3a-7 exemption to the Investment Company Act of 1940. Under this exemption, a broad variety of assets not previously eligible can now be securitized.[7] According to Asset Sales Report , the adoption was "politically geared toward fostering the securitization of small business loans" and thus to alleviate the credit crunch (ASR, November 30, 1992, p. 1). However, the effects are more far reaching than just small business loans, allowing for the securitization of student loans and unsecured consumer loans, for example. Second, the Clinton administration has expressed support (with modifications) for the Financial Asset Securitization Investment Trust (FASIT), proposed to Congress in May,

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[5]The first private issue occurred slightly earlier in 1985 by Comdisco, a $35 million issue backed by computer leases.

[6]Asset Sales Report, January 1, 1994, p. 1. Hereafter Asset Sales Report will be referred to as ASR and references will be made parenthetically.

[7]Prior to this exemption, ABSs were issued under exemptions provided by Rule 3c-5 to the 1940 Act. Under Rule 3c-5(a), assets that primarily represented the purchase price of merchandise, services, or insurance qualified--auto and credit card ABSs used this. It did not apply (except for small amounts) to cash advances on credit cards. Under Rule 3c-5(c), assets that represented an interest in mortgages or real estate qualified--home equity loans used this. Issuers could also apply for special exemptions under Rule 6-c, but these were largely limited to "partial pool" agency issues backed by mortgages. The new Rule 3a-7 expands the definition of assets: eligible assets now cover "financial assets, either fixed or revolving, that by their terms convert into cash within a finite time period, plus any rights or other assets designed to assure servicing or timely distribution of proceeds to the security holders." By this definition, the only thing clearly excluded is stock.

1993 (H.R. 2065) (ASR, June 28, 1993). FASIT would extend the tax benefits of the Real Estate Mortgage Investment Conduit (REMIC) to assets other than real estate.[8] Third, there has been legislative effort to encourage a secondary market for business loans via the securitization technology. The sponsor, Representative Paul Kanjorski, said that the "ultimate goal is to allow the private sector, through the new secondary market, to take business, commercial, and community development debt and equity investments, place them in securitized pools, and create investment products which are attractive to pension funds and insurance companies."[9] Whatever the political or economic merits of these legislative proposals, it is clear that securitization is being pushed forward as if it were a panacea for the credit crunch.

Given the significant growth of the ABS market and its future potential, a rigorous evaluation of the factors that determine ABS pricing is important. This analysis finds that ABS pricing (absolute and relative yield spreads) is rational and prices reflect premiums for default risk, interest rate and reinvestment risk, and marketability. Spreads are found to have widened over time due to market recomposition. But spreads for homogeneous

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[8]"Under the proposal, the FASIT, a legal entity, could issue multiple classes of securities and substitute assets. The latter action is essential for the securitization of revolving and short-term assets like credit cards and trade receivables, home equity lines of credit and small business loans" (ASR, June 21, 1993, p. 1).

[9]ASR, July 6, 1993, p. 1. This bill does not propose the creation of a new government sponsored enterprise. Rather, it proposes a chartering process to allow a private entity to create a market. The securities issued under the charter would be exempt from certain regulations, much like securities issued by Fannie Mae and Freddie Mac. (According to ASR [April 26, 1993, p. 1] "This implies that small business loan securities would gain the benefits of the Secondary Mortgage Market Enhancement Act of 1984, including favorable risk weighting.") However, it also requires chartered entities to agree to goals to "promote lending to businesses in low to moderate-income areas or enhance 'employment opportunities'."

securities show no trend. As one would expect in a rapidly evolving market, institutional forms have changed frequently, and new ones have been added, over the sample period. To some degree, the market has required premiums for the unfamiliar or new and discounted for experience. ABSs in general do not exhibit negative convexity and are not subject to excessive prepayment risk. Although the complicated structures utilized to separate the risk of the collateral from the risk of the originator are effective, as indicated by the preponderance of AAA rated issues, investors nonetheless require information in addition to credit rating concerning an issue's pool and/or servicing when pricing the issue.

Chapter 2 reviews the institutional features of the asset-backed market. First the market for the securities is described, including its pattern of growth, range of assets securitized, and buyers and sellers. Then the asset-backed security itself is examined in some detail. This section provides background and impetus for the empirical study to follow. Chapter 3 reviews the relevant pricing literature, drawn primarily from corporate bond and mortgage-backed security (MBS) pricing studies. It concludes with a discussion drawn from the ABS literature of additional ABS pricing considerations. Chapter 4 motivates the regression pricing model by examining the sources of priced risk and lists the hypotheses under investigation. The methodology and data are presented in Chapter 5, while Chapter 6 analyzes the results of ordinary least square (OLS) regressions. Chapter 7 concludes.

Appendix A contains a glossary of ABS terminology, and Appendix B defines the variables and abbreviations used in the regressions. Absolute spreads are used in the

primary regressions in Chapter 6; Appendix C contains parallel regressions for the relative spread model.

CHAPTER 2
INSTITUTIONAL FEATURES OF SECURITIZATION

The Market for Asset-Backed Securities

The growth of credit securitization has been truly astounding (see Figure 1). New public issues of securities backed by assets other than mortgages were over $60 billion in 1993 and may be as high as $70 billion in 1994 (ASR, January 10, 1994, p. 1).[1] There is room to grow; by the end of 1990, for example, 40% of 1-4 family residential mortgage debt was securitized, only 10% of consumer debt (Dreyer, 1991).

The variety of ABS collateral associated with 1992 issues is shown in Table 1. All categories, with the exception of home equity loans and credit cards, increased over 1991.[2] Although the market has been and continues to be dominated by just a few collateral types, there has been an interesting variety of collateral involved in securitization in the private and/or public markets. Among these are tenant leases (ASR, March 22, 1993), payments due on travellers checks (ASR, October 5, 1992), cash flows

[1]"The asset-backed securities market, overall, has been the fastest-growing segment of the fixed-income market." (Mitchell and Adler, 1991, p. C19). The ABS market, however, is still just a fraction of the older mortgage-backed market. Outstandings of residential mortgage-backed, pass-through securities went over $1 trillion by year-end 1990 (Dreyer, 1991). This popularity, of course, has been due in large measure to the credit enhancements provided by government agencies responsible for creating a secondary market for residential mortgages.

[2]Home equity backed issues dropped a whopping 40% from 1991, primarily due to the sluggish economy and, especially, the increase in mortgage refinancings in 1992. Homeowners often consolidate second mortgages and home equity loans into a new first lien mortgage.

from service contracts (ASR, November 23, 1992), third world debt (ASR, March 20, 1989), and U.S. military sales debt (by the Kingdom of Morocco, ASR, October 30, 1989).

The largest collateral category, the auto loan sector, offers a helpful characterization of the market. While the market is broadening over time--a larger number of smaller issuers--it is still dominated in dollar terms by a small number of high volume issuers. In 1992, the top five issuers of auto ABSs originated 53% of the auto-backed dollar volume (ASR, April 26, 1993), with General Motors the dominant issuer (replacing Chrysler from 1991).[3]

Examination of the types of collateral points out a major characterization of credit securitization. Some loans are more amenable to credit securitization than others. Loans that are pooled must have similar characteristics so that the pool can be relatively easy to evaluate by investors, rating agencies, and insurers. Residential fixed rate mortgages used as collateral in mortgage-backed issues are relatively homogeneous and thus make excellent pooled assets. Auto loans and credit card receivables are also relatively homogeneous and thus form the bulk of nonmortgage asset-backed issues. Commercial loans tend to be much less homogeneous and often must be evaluated individually. They tend to be fairly large and complex and have terms that vary across borrowers. Thus they are usually not pooled and are sold whole or in part by loan participations. Of course, as the ABS technology develops and market conditions vary, this characterization is

[3]General Motors suffered a rating downgrade, which was its impetus for expanding in the ABS market.

changing. For example, adjustable rate loans were generally considered less favorable candidates than fixed rate loans for securitization because they do not have a fixed payment stream, making them difficult to value and structure as an ABS. In addition, the market preferred fixed rate issues until recently. But variable rate ABS issues have become quite common since the fall of 1992, due to advances in the ability to structure these issues and due to market demand because of cyclically low interest rates. Likewise, some commercial loans have been securitized.

The largest sellers (originators) of ABSs are presented in Table 2. In dollar terms, Citicorp is the largest originator, with over $30 billion of securities sold in 36 issues. Chrysler, however, had 39 issues through the end of 1992, the most number of issues, although Sears was not far behind with 37 issues. The top ten originators include five banks and three automobile manufacturers, echoing the collateral types in Table 1 and indicating the dominance of these two industries in the ABS market. Banks, in fact, are the largest originators with over $83 billion issued (see Table 2). But the captive finance companies are not far behind with $80 billion sold. The captive finance companies include primarily the consumer finance arms of the automobile manufacturers, as well as providers of retail credit cards (e.g., department stores) and mobile homes (e.g., Fleetwood). The largest buyers of ABSs are pension funds, insurance companies, mutual funds, thrifts, and commercial banks. Foreign buyers have become increasingly active, especially with the increase in variable rate ABSs in late 1992, which are usually pegged

to LIBOR (London interbank offered rate). Recently, some ABS issues have tried to attract money market funds by including a short-term money market tranche.[4]

The Framework of an Asset-Backed Security

The basic process of creating a nonmortgage asset-backed security involves six steps: (1) pooling, (2) credit enhancement, (3) establishment of a special purpose vehicle to own the assets, (4) repackaging cash flows, (5) rating the issue, and (6) selling the securities to investors. There can be a large number of participants, with separate entities possibly originating, issuing, structuring, distributing, servicing, insuring, monitoring, and rating. The process is illustrated in Figure 2.

A large number of homogeneous assets (in terms of credit quality, maturity, and interest rate risk) are pooled together by the originating firm in order to diversify credit risk and to reach the minimum size required to justify a public securities offering. A special purpose vehicle (SPV) is established to own the underlying securities. This trust or corporation is set up to separate the risks of the pool of assets from all other risks of the originator or fund raiser; the special purpose vehicle's business is usually restricted

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[4]The first such ABS was a John Deere issue in September 1992, which included a money market tranche with an expected average life of 0.42 years. It was structured as a pay-through rather than a pass-through in order to create the short-term tranche (these terms are defined in the next section). This issue has been successful, but other issues' money market tranches face problems. The problem is that most money market tranches are fixed rate with expected average lives of 4 to 8 months and with legal final maturities of 1 year. Because the exact maturity is not sure, mutual funds must book these investments as 1 year holdings--i.e., to the final maturity date. Because the SEC requires money funds to maintain an average maturity of 90 days, 1 year holdings may increase the average too high. John Hollyer, manager of Vanguard's Prime Portfolio money fund, "[r]arely [makes] a one-year investment." The Deere tranche avoided this problem by resetting the rate (against LIBOR) every three months. Money market funds are permitted to book such resets as 90 day holdings (ASR, March 29, 1993, p. 3).

to the purchase of the assets and the issuance of securities backed by those assets.[5] Because the assets in the pool are totally separated from the credit risk of the originator, even should the originator default, investors have uninterrupted access to the underlying assets. Thus, this is an improvement even over secured debt, where bankruptcy would probably delay repayment. Removing the assets from the balance sheet via a true sale to the SPV also has important regulatory advantages, especially for a bank, which thereby reduces its required capital as well as the necessity of funding these loans with deposits subject to reserve requirements. A nonbank also benefits by sale, because it lowers its GAAP (Generally Accepted Accounting Principles) leverage which can affect debt covenant compliance and/or pricing.[6]

Rights to receive the repackaged cash flows are sold to investors. An investment banking firm typically underwrites the new securities. A rating agency will rate the issue. A servicer, most often the originator, is responsible for collecting interest and principal payments on the assets in the underlying pool and transmitting these funds to the investors. The servicer is obligated to "manage and maintain control of the assets and [the issue's] payment stream" (Watson and Joynt, 1989, p. 234). This is a key role. These can be extremely complicated securities, and transaction management can be a difficult task; it is important that it is done well and for the life of the issue. The servicer must be of sufficient credit standing because among its functions is to collect and

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[5]See Rosenthal and Ocampo (1988, pp. 48-63) for details on the tax considerations, advantages, and limitations of various kinds of special purpose vehicles such as grantor trusts, owner trusts, and debt.

[6]Details on GAAP are provided in the next section on credit enhancement.

hold payments till passed on to the investor and to make advances on delinquent payments. Also, the servicer, through collection procedures and policies, maintains pool quality and can influence payment behavior.

Monitoring is performed by a trustee as well as accounting firms (periodic audits) and the rating agencies. The trustee of an ABS, as with any security issue, represents the interests of the investors. The trustee authenticates the issue's legality at the time of issue, watches over the financial conditions and behavior of the issuer, and makes sure all contractual obligations are carried out (Standard & Poor's, 1988, p. 19). The rating agency continues to monitor the issue over its life as it reaffirms or changes the tranche ratings.

Two apects of the securitization process demand special attention--credit enhancement and the cash flow structure.

Credit Enhancement

Credit enhancement is added to the issue in order to raise the rating of the resulting securities to investment grade. To be marketable and competitive with federal agency-backed mortgage issues (i.e., government guaranteed), private issues need a default risk comparable to that of Agencies'. The problem, of course, is that the underlying securities to whose cash flows the ABS purchasers have claims are too difficult or expensive for many market participants to evaluate for themselves. Hence, successful securitization depends on the issuer devising a mechanism to separate the risk of the ABS cash flows from that of the underlying securities. The credit enhancement can occur in a variety of ways including a senior-subordinated structure, a recourse

provision, overcollateralization, letters of credit, surety bonds, spread accounts, or cash collateral accounts. Many of these forms of enhancement can be provided by either a third party or the originator.[7]

One way to divide the credit enhancement methods is between those primarily provided by a third party and those that create a self-supporting structure. Third party insurance was the primary form of enhancement throughout the 1980s; still very popular, it includes surety bonds or guarantees by (primarily) insurance companies and letters of credit issued by (primarily) large commercial banks. When the credit risk is shifted from the pool quality to the balance sheet of the third party enhancer, risk analysis by the ratings agencies focuses on that third party enhancer. For example, when insured by a letter of credit, the Duff and Phelps credit rating on the tranche is determined by the providing commercial bank's senior debt rating (see Gold and Schlueter, 1993, p. 156).[8]

Both letters of credit and surety bonds protect some stated percentage of principal and interest payments, often up to 100%. The letters of credit must be irrevocable (not standby) to avoid discretionary action by the providing bank at the time of need. Surety bonds are "guarantees placed on the assets (i.e., student loan guarantees) or on the individual notes or certificates (i.e., financial guarantees) to provide for payment of principal and interest on the defaulted assets or securities" (Gold and Schlueter, 1993, p.

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[7]Credit enhancement is a very important cost factor in credit securitization. Nine banks that had issued card-backed securities in 1991 did not have any issues in 1992, partly because the cost of credit enhancement had become too high (Kleege, 1993).

[8]S&P echoes this reliance on the third party enhancer's credit rating. However, Griep points out that the failure of a few banks involved in the ABS business and the weakness of several others have led to an increased examination of the underlying projects (Griep, 1993, p. 144).

156). That is, in the event of a borrower default, the insurer will immediately pay out the remaining principal (a prepayment) and any interest due. A 100% "surety wrap" is a guaranty of principal and interest on both A (the senior) and B (the subordinate) pieces. The primary providers are financial guaranty firms, property-casualty insurers, and banks.[9] The originator may also be the enhancer if its corporate rating is high enough.

The use of self-supporting credit enhancement structures increased throughout the late 1980s and into the 1990s for two important reasons. First, the credit quality of the banking and insurance industries declined, accenting the event risk that the insurer could have its rating lowered. An ABS can be rated no higher than that of the third party insurer. Second, the banking industry experienced "the imposition of more conservative bank regulatory treatment and risk-adjusted capital guidelines have increased the capital charges for recourse" (Griep, 1993, p. 145). Banks withdrew from the ABS LOC (letter of credit) business. Self-supportive structures include senior/subordination, overcollateralization, spread account, and cash collateral structures. These enhancement methods eliminate reliance on third parties, but they also reduce third party review of collateral.

A senior-subordinate structure can have two or more tranches, with at least one subordinate. In a typical deal, principal on the junior notes (the "B" class or tranche) is not paid until the senior portion (the "A" class or tranche) is retired. If the amount of subordination is 5% of the issue, the subordinate tranche absorbs the first 5% of any

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[9]The financial guaranty firms are also known as monoline insurers and include MBIA (Municipal Bond Investors Assurance Corporation), CapMac (Capital Markets Assurance Corporation), and FGIC (Financial Guaranty Insurance Company).

losses on the underlying collateral, and thus provides the senior portion with credit enhancement. The junior portion can be sold or retained by the issuer. If sold, the B class requires a higher yield to compensate for this increased risk. In addition, the market for these subordinate tranches is less liquid than the market for the senior tranches, also contributing to a higher required yield. (Griep [1993] points out that these B securities are increasingly being bundled and securitized themselves, increasing their liquidity.) A potential problem with the senior/subordinate structure is a cash flow availability problem. That is, with third party support, as soon as a loss is realized, a claim can be made to the enhancement provider and funds are immediately forthcoming. However, a subordinate class can only give up cash flows currently due to it, and these funds may not be able to cover every loss in a timely manner.

With overcollateralization, the value of the underlying assets exceeds the face value of the securities. The amount of overcollateralization thus provides a cushion for the security holders and amounts to an equity layer in the SPV. This form of enhancement is not usually a primary form of enhancement. It is usually used when enhancement is "difficult to obtain but assets are plentiful" (Millard, 1993, p. 130).

A cash collateral account is basically a cash loan to the issuing trust (SPV) of an ABS by the originator or a third party. The cash, often between 5% and 10% of the issue, is invested in high quality securities and commercial paper. This highly liquid account is then available to cover any borrower defaults. The cost for the SPV is the difference between the rate charged on the loan and the rate earned on the cash collateral investments. Cash collateral accounts have become a more prevalent form of credit

enhancement in recent years for two reasons--they are effective in eliminating the "event risk" that the third party insurer may be downgraded, and they have been a way for banks with less than triple-A ratings to get back into the credit enhancement business, since the cash is provided up front and is therefore not dependent on the provider's rating.[10] Banks who previously acted as third party insurers by issuing letters of credit now provide loans for cash collateral accounts. Cash collateral accounts are said to be more expensive to provide than LOCs because they are funded assets, but it is felt that cost for the SPV is made up in a reduced yield because of the event risk protection.[11]

The type of credit enhancement utilized depends to some degree on the originator. The goal of securitization in most cases is to remove the assets from the balance sheet of the originator, i.e., to effect a true sale. Banks face stricter requirements than do nonbanks in qualifying a transfer of assets as a sale. Under RAP (Regulatory Accounting Principles), which banks must satisfy, sales with recourse are not "true" sales and the securitized assets generally cannot be removed from the balance sheet (for regulatory purposes).[12] However, GAAP (Generally Accepted Accounting Principles), which

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[10]There is another way for less than triple-A banks to remain in the enhancement business and still provide letters of credit, the rarely used "hybrid" structure. With this method a double-A bank, say, provides a letter of credit with the stipulation that if the bank is further downgraded, the letter of credit will be converted into a cash collateral account.

[11]For example, Bank of New York, in a credit card deal in March of 1991, "saved 10 to 15 basis points in yield by using the cash backing, [said] market sources" (ASR, April 8, 1991, p. 8). The first issue to use a cash collateral account as a replacement for a letter of credit was MBNA, also in March of 1991.

[12]However, a major exception to this rule applies to transfers of pools of residential mortgages (not considered here) with a recourse feature. Such transfers can be reported as sales as long as the originating bank does not retain any "significant risk of loss." The amount is vague, but general consensus is that some amount less than 10% of the principal is not significant.

nonbanks must satisfy, does allow sales with recourse.[13] This means that banks are much more likely to employ third party guarantors, via a surety bond, a standby letter of credit, or a third party cash collateral account. Nonbanks, on the other hand, are more likely to employ the senior/subordinate structure and retain the junior position in the pool. This junior position allows the originator to absorb the "usual" level of default risk associated with the particular type of asset. These first loss obligations under the recourse provision or the senior/subordinated structure make the sale one with recourse--a sale under GAAP, not under RAP. Thus there could be no equity savings for banks using a senior/subordinate structure where the subordinate position is retained. Instead, the transfer would be treated as borrowing.

There is one exception, for banks, that allows them to offer additional credit support themselves for nonmortgage collateral and still make a sale under RAP. This is the "spread account" structure (also referred to as a reserve account). The spread account is simply a type of escrow account. The way it works is simple: asset-backed certificates carry promised payments below those on the underlying assets. The proceeds from this spread, less a servicing fee, are collected in the spread account up to a stated level. After that, the spread goes to the originator. The funds in this spread account provide credit support for the asset-backed securities. After the securities are completely paid off,

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[13]Asset transfers with recourse are treated more liberally under GAAP, where sales or financing treatment are specified by Financial Accounting Standards Board Statement No. 77. Three criteria establish a transfer of receivables with recourse as a sale: (1) the transferor surrenders control of the future economic benefits relating to the receivables; (2) the transferor can reasonably estimate its obligation under the recourse provisions; and (3) the transferee cannot return the receivables to the transferor except pursuant to the recourse provisions. Regulatory Accounting Procedures (RAP) require (for there to be a sale) no risk of loss from any cause and no obligation to any party for the payment of principal or interest for any cause.

anything left in the spread account will revert to the originator. Only at that time will the originator take the funds in the spread account as income. Because it is not income until that time, any use of the account to cover payment defaults will not result in a loss to the bank. Consequently, regulators have determined that asset sales with spread accounts do qualify as sales under RAP. Spread accounts are especially common with credit card receivables.

It is quite common for issues to use a combination of credit enhancement techniques to achieve the desired rating. A spread account may exist in tandem with a third party guarantee, for example, thus lowering the cost of the third party insurance.

Cash Flow Structure

There are four major cash flow structures employed by ABSs: pass-through, controlled amortization, bullet, and bond.[14,15] These structures or similar predecessors were developed in the mortgage-backed security market and are more familiar to many

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[14]A passive grantor trust is the legal form of the entity (SPV) that will typically issue pass-through securities. Controlled amortization and bullet structures (pay-throughs) and asset-backed bonds are issued by corporations and owner trusts. For further discussion of these legal forms see Pavel (1986, 1989) and Frankel (1991). Note that a passive grantor trust does not allow transformation of cash flows, i.e., the cash flows are passed on to the ABS security holder when and as received. Bonds and pay-throughs do allow transformation (e.g., monthly payments to quarterly or semiannual payments).

[15]While these are the major structures, commercial paper and preferred stock have also been issued backed by pools of assets. Usually the commercial paper issuer or SPE is a conduit established for the sole purpose of purchasing assets and issuing commercial paper. Preferred stock ABSs are issued when the issuer has no tax liability because of tax-loss carryforwards, a foreign tax credit, or an investment tax credit. Neither of these structures will be included in the tests; commercial paper is not included in the sample, and preferred stock is different because of the corporate dividend exclusion rule.

in that context.[16] Credit securitization effectively began in 1970 with the Ginnie Mae pass-through, developed by the Government National Mortgage Association (GNMA). This is a mortgage-backed security collaterized by single-family Federal Housing Administration (FHA) and Veterans Administration (VA) mortgage loans. A pass-through represents direct ownership in a portfolio of loans that are similar in term to maturity, interest rate, and quality.[17] Certificates of ownership of the portfolio, which is placed in trust, are sold to investors, who essentially have an equity position in the pool. The loan originator services the loan by collecting interest and principal and passing them on, minus a servicing fee, to the investors. There is often a second middleman, such as GNMA, which receives the principal and interest from the originator and passes it on. Because ownership lies with the investor (buyer), pass-throughs are removed from the balance sheet of the issuer. GNMA is a direct agency of the federal government; the government guarantees timely payment of principal and interest. Investors therefore face virtually no default risk, and an active secondary market provides a high degree of liquidity for these securities.

Other pass-through mortgage-backed securities followed. The Federal Home Loan Mortgage Corporation (Freddie Mac) developed the participation certificate (PC) in 1971 and the Federal National Mortgage Association (FNMA, i.e., Fannie Mae) developed the mortgage-backed security (MBS) in 1981. Both are backed by portfolios of uninsured

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[16]The discussion here of the mortgage-backed market and its innovations is necessarily limited in scope. For a more complete description of the securities and the historical perspective, see Fabozzi and Modigliani, 1992, Chapters 2 and 11.

[17]It is not permissible to substitute assets in this structure and usually there can only be a single class, except for an additional single subordinate class retained by the issuer.

and privately insured mortgages. As indirect agencies of the federal government, there is an indirect government guarantee of interest payments and full repayment of principal. These mortgages tend to be paid off faster than Ginnie Maes. FNMAs have been successful in part because of their swap program, where a mortgage lender can swap whole mortgage loans for MBSs. The Mortgage-backed bond (MBB) is much less common than the other types because the mortgages used as collateral remain on the books of the issuer. The MBBs are reported as liabilities. The cash flows from the mortgage collateral are not dedicated to the payment of interest and principal on MBBs; rather, MBBs have a stated maturity and interest is usually paid semiannually. Credit enhancement is provided by overcollateralization. The advantage to the issuer is that through MBBs the loans are funded with long-term liabilities (usually between five and twelve years).

The pay-through bond, like an MBB, remains on the issuer's books. However, the cash flows are dedicated to servicing the bonds as with a pass-through. The collaterized mortgage obligation (CMO), first issued by Freddie Mac in 1983, is a familiar example (the volume of CMO issuance had become $59.9 billion by 1987). Typically, each CMO issue is divided into a number of different maturity classes; four is common but there have been as many as ten. The first (shortest maturity) class receives the first installments of principal payments and any prepayments until class 1 bonds are paid off. Then these payments go to class 2, and so on. These can be characterized as sequential-pay classes. In this way the terms of the maturities are more certain and prepayment risk is mitigated. Almost half of all CMOs are collaterized with federal agency pass-throughs

(a process referred to as resecuritization). The primary advantages of CMOs are the creation of shorter maturities and the prepayment protection.

Despite these innovations, many potential investors did not participate in the MBS market because of what they still perceived as significant prepayment risk. Thus, structures were developed to create even more certainty in cash flows. In 1987, M.D.C. Mortgage Funding Corporation issued the first Planned Amortization Class (PAC) bonds. A PAC bond provides a fixed monthly payment as long as the prepayment rates on the underlying collateral fall within a predetermined range. This cash flow stability is achieved by giving principal payments of the PAC bonds higher priority than other CMO classes, the companion or support classes which thus absorb a disproportionate share of the overall prepayment risk. Rather than a sequential-pay characterization, as with the earlier CMOs, these bonds are characterized as simultaneous-pay. Faster- or slower-than-expected prepayment risk is absorbed by the companion tranches as long as prepayment rates remain between the prepayment "collar" (generally between 80% and 300% PSA, the Public Securities Association standard prepayment benchmark [Fabozzi and Modigliani, 1992, p. 254]). A Targeted Amortization Class (TAC) is similar to a PAC, but this class only offers protection from faster than expected prepayments. Their expected average life can lengthen if prepayments are slower than expected.

Nonmortgage asset-backed securities utilize many of the same structures. The pass-through is the most common structure and has been backed by auto loans, credit card

receivables, boat loans, and RV loans.[18] Despite their freedom from credit risk (due to various types of credit enhancement), these securities still expose investors to interest rate risk and prepayment risk. The latter is the risk that the investor who paid a premium for the ABS will receive a lower than expected return because of faster than expected repayment (generally occurring with a decline in interest rates) or that the investor who bought the ABS at a discount will receive a lower than expected return because of slower than expected prepayments.

Controlled amortization, bullets, and bonds offer progressively more certainty as to the timing of cash flows and offer a reduction in prepayment risk. This is a result of a transformation of cash flows not allowed with the pass-through structure. With transformation of cash flows, not only can the payments be changed from monthly to, say, quarterly, different classes of the liabilities can have different expected maturities and payment schedules, such as interest only and principal only streams, or sequential classes where prepayments of principal are first applied to one class, then the next, and so on. Some of these securities may even have a stated maturity.

This restructuring of cash flows is advantageous for many institutional investors, who prefer the more certain maturity and payments that match the frequency of their own obligations. For example, thrifts prefer the shorter tranches, which match up better with the short maturities of their liabilities. Pension funds have longer horizons. It also has advantages for the issuer; by tailoring cash flows to meet investor demands, it may be

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[18]Automobile loans were first pooled and sold in 1985 and are known as CARS (Certificates of Automobile Receivables). Securitized credit card receivables are known as CARDS (Certificates of Amortizing Revolving Debts).

possible to achieve a lower blended yield than with a single secured debt issue. Rosenthal and Ocampo (1988, p. 55) claim that "[p]roperly managed, several tranches of securities of different maturities may be designed that produce a lower weighted average interest rate than the interest rate that investors would receive for a single maturity instrument." Presumably this translates to a net cost savings for the issuer.

Controlled amortization developed from the simultaneous-pay tranches of the PAC structure. Controlled amortization refers to a cash flow structure with an initial revolving period of uniform interest-only payments, followed by an amortization period of preset length where interest and principal are paid to investors until the principal is paid off.[19] A typical structure might have a 36 or 48 month revolving period followed by a 12 month amortization period (although there have been amortization periods as long as 24 months). This differs from the PAC structure because instead of companion or support classes, the usual structure uses some kind of reinvestment account or "principal funding account," whereby principal payments received before the amortization period are reinvested so as to make likely sufficient cash flow to make all principal payments during the amortization period. Similarly, if payments are slower than expected, the provider of the principal funding account advances funds to make necessary principal payments. This is an affordable option with nonmortgage asset-backs because prepayment risk is not as serious a potential problem with the shorter maturity, less refinanceable collateral. Investors are not totally free of prepayment concerns, however. Excessive prepayments could trigger

[19]There is a new variation on the controlled amortization structure, referred to a managed amortization. In this structure, there is a managed amortization period, where principal is partly paid out to investors and partly reinvested, followed by a rapid amortization period or payout period. See ASR, December 14, 1992.

an "early amortization event," where the security immediately begins to amortize in the interest-only period as a protection of principal. Such event "triggers" are described in the issue's prospectus.

A bullet maturity structure is a refinement of the controlled amortization structure. It implies a stated date where principal is paid off all at once, like a bond.[20] Principal payments received by the SPV before this date are invested in high quality short-term investments until the expected maturity date. A soft-bullet is a variation on the bullet structure; principal is paid off over a short period near the expected maturity date, thus giving the issuer some flexibility.[21]

The advantage to the issuer of a controlled amortization structure is the ability to pay out principal gradually. In a steep yield curve environment, a controlled amortization structure is less appealing to an investor than a bullet, which has a single principal payout, because investors face reinvestment risk, i.e., the possibility of reinvesting at a

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[20]But note the difference from a bond--it need not be paid off at that time. To delay would not imply default. "If the PFA [principal funding account] is not fully funded, a maturity guarantor or the PFA provider will guarantee the investors' principal bullet repayment up to a specific percentage of the initial offering" (Raab, 1990, p. 12).

[21]"On the stated maturity date, the PFA may not be fully funded . . . the current PFA balance would be distributed to investors with the remainder of the outstanding balance amortizing until the certificates are retired" (Raab, 1990, p. 11). One way that these principal repayment dates are made more certain is through a "minimum principal repayment agreement," first used by GMAC in 1987 (ASR, August 3, 1987, p. 1). Under this scenario, the security is issued under an assumed prepayment rate. An up-front fee is paid to a guarantor (Morgan Bank in the GMAC issue) so that (1) if the loans pay off faster than expected, the principal payments will be deposited with the guarantor, who pays an agreed return that is high enough to meet future principal and interest payments; and (2) if the prepayment rate is slower than anticipated, the guarantor will advance needed funds by acquiring issuer debt obligations.

lower rate. In a flat rate environment, controlled amortization is usually preferred, because of the possibility of investing at a higher rate if the curve changes.

Even subordinate (B) tranches can have their cash flows made more certain. One method is some form of "tail protection," i.e., a method used to shorten the payout period on the security. This prevents an overly drawn out life for the subordinate tranche. An example of "tail protection" is the "accelerated defeasance technique," which uses excess cash flows from the deal to pay down the B securities after Class A has been paid. Or, a stated maturity guaranty bond might be employed to "swap out the tail," that is, redeem the remaining B securities at some predetermined date. Another method used is the auction call option. In the case of a 1991 Household Finance home equity deal, for example, after five years a call option takes effect if the original issue outstandings fall below 25%. The trustee for the issue holds accepts bids for the option. If successful, the B security holders are paid their principal. If the auction is not successful, the class B holders receive a boost in yield to compensate them for the extra holding period (see ASR, September 2, 1991).

Implications for Pricing

A few facts emerge from this discussion that could greatly affect the pricing of an ABS. The collateral underlying these securities is broad-ranging, although there are a few major categories. The originators vary as well--banks may be the most common, but there are other financial companies as well as nonfinancial firms heavily involved. These securities are typically credit enhanced to ameliorate default risk, but there are a myriad of ways to accomplish this. The payment characteristics of the security can vary--

by different cash flow structures and by frequency. These are factors that will be added to the traditional bond and mortgage-backed pricing models from previous studies. The following chapter reviews this literature.

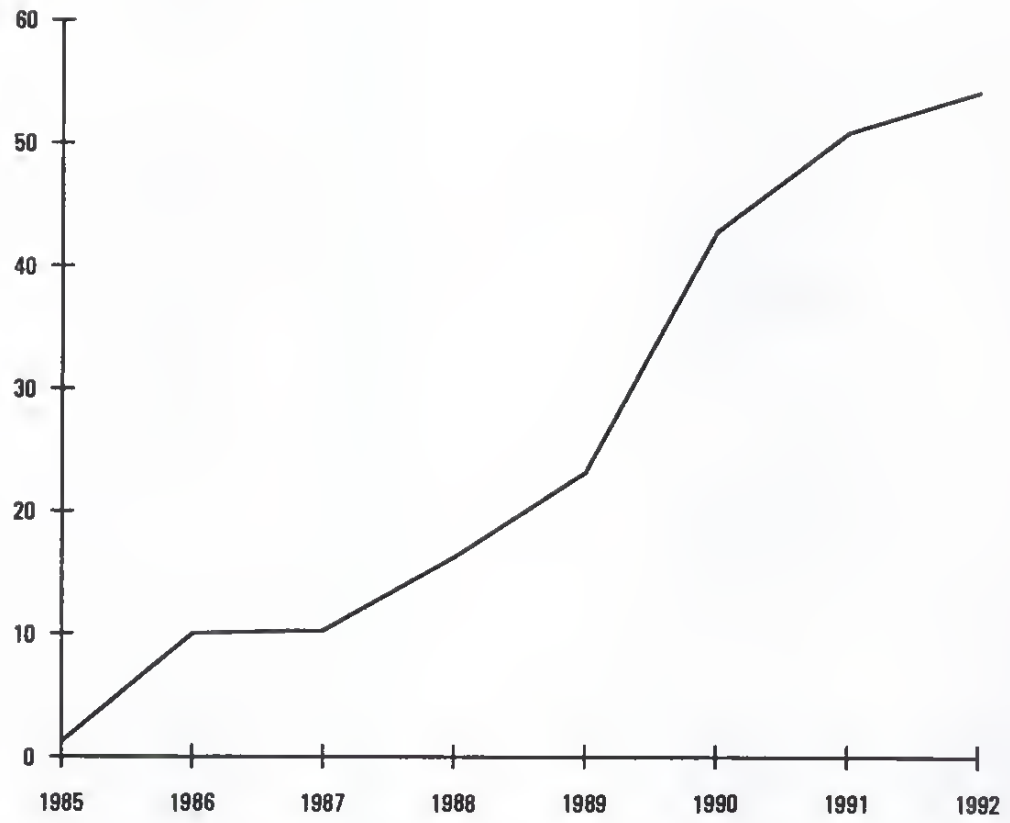
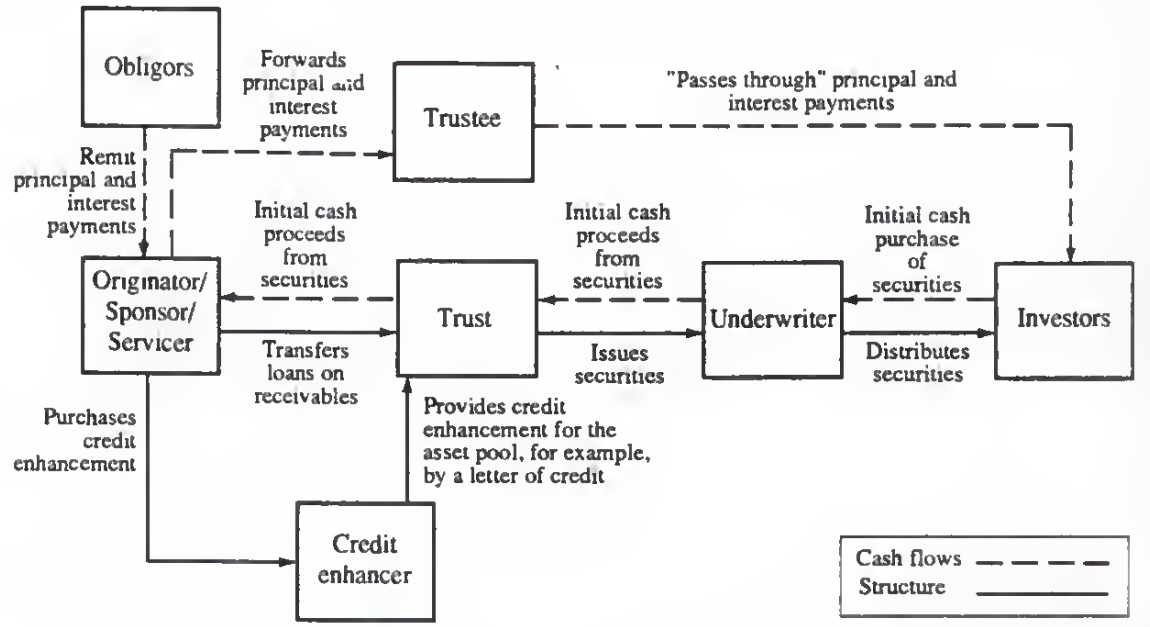


FIGURE 1: ASSET-BACKED SECURITY NEW ISSUE VOLUME ($ BILLION)
(Annual Public Domestic Issues)

Pass-through, asset-backed securities: structure and cash flows



Source: Boemio and Edwards, 1989

FIGURE 2: THE ASSET SECURITIZATION PROCESS

TABLE 1: 1992 NONMORTGAGE ABS ISSUANCE, BY COLLATERAL

COLLATERAL	$ (MILLIONS)	%
Auto Loans	$16,205	31.7%
Credit cards	$15,677	30.6%
Home equity Loans	$5,786	11.3%
Auto dealer floorplan Loans	$3,500	6.8%
Manufactured Housing	$2,645	5.2%
Leases (computer, Railcar)	$1,241	2.4%
Farm Equipment Payments	$1,050	2.1%
Student Loans	$373	0.7%
Exim Bank	$352	0.7%
Small Business Loans	$350	0.7%
Home Improvement	$220	0.4%
RV, Boat Loans	$198	0.4%
Other	$3,603	7.0%
Total	$51,200	

Source: ASR, February 3,1993

TABLE 2: TOTAL ISSUE DOLLARS BY LARGEST ORIGINATOR AND INSTITUTIONAL FORM

TEN LARGEST ORIGINATORS	NUMBER OF ISSUES	TOTAL ISSUE DOLLARS (MILL)	MEAN SIZE
Citicorp	36	$30,133.6	$837.0
General Motors	27	$26,343.5	$975.7
Chrysler	39	$22,750.5	$583.4
Sears	37	$17,599.3	$475.7
Household Financa	21	$12,193.6	$580.7
Ford	8	$8,646.9	$1,080.9
Sacurity Pacific	24	$7,653.9	$318.9
Firrst Chicago	10	$6,900.0	$690.0
Maryland National Corp	10	$5,024.7	$502.5
Chasa Manhattan	8	$4,652.0	$581.5
INSTITUTIONAL FORM			
Bank	190	$83,781.8	$441.0
Captiva Finance Co.	149	$80,731.2	$541.8
Other Financial Institution	80	$28,609.7	$357.6
Savings and Loan	55	$9,127.4	$166.0
Non-Financial	29	$6,468.7	$223.1

CHAPTER 3
PREVIOUS LITERATURE

There has been no pricing study of ABSs. This study's analysis is anchored in prior studies of the determinant yield spreads on corporate bonds and mortgage-backed securities. This chapter contains a review of that literature and concludes with a discussion of other possible ABS risk factors described in the ABS descriptive literature.

Bond Pricing Studies

The seminal bond pricing paper was by Lawrence Fisher (1959), whose basic model is still employed in most studies today. Fisher's model states that a bond's risk premium depends on a number of risk factors under the rubrics of risk of default and marketability. The risk of default is captured by three factors: a measure of volatility (Fisher uses the coefficient of variation of the issuing firm's net income), a leverage measure (market value of equity to book value of debt), and the length of time the firm has been operating without a default. Marketability is proxied by the market value of all bonds outstanding by the firm. Fisher uses these four variables, all in log form, and specifies a linear relationship. (He does examine some alternative measures.) The risk premium depends positively and significantly on default risk, negatively and significantly on marketability. The model has developed somewhat over time, especially in the inclusion of variables for special characteristics such as call provisions, sinking funds, and

so on. But it is still common to assume a linear relationship between yield (risk premia) and a number of risk measures or indicators.

The current study will use primary market issue prices. A number of bond pricing papers have used primary market issue prices. Among them are Allen, Lamy, and Thompson (1987), which examines alternative call provisions (call protection versus refunding protection); Fung and Rudd (1986), which looks at the seasoning effect (new issues versus existing issues) and the cost of underwriting; Sorensen (1979), which examines the method of underwriting and bidder competition; Kidwell, Marr, and Thompson (1984), which examines the effect of shelf registration on pricing; and Billingsley, Lamy, and Thompson (1986) which looks at the pricing of convertible bonds.

All find that spread or yield measures (the dependent variable) depend positively and significantly on default risk as measured by rating dummies and positively and significantly on interest rate volatility. There are mixed results for issue size (a proxy for marketability), call provisions, and maturity. The size of the issue enters negatively and significantly except for Billingsley, Lamy, and Thompson (1986) and Kidwell, Marr, and Thompson (1984), where the coefficient is negative but insignificant, and Fung and Rudd (1986), where the coefficient is positive and insignificant. A call provision is generally positive and significant, but shows no significance in Billingsley, Lamy, and Thompson (1986) and, again, has the opposite sign in Fung and Rudd (1986). Maturity of the bond generally has a positive, significant coefficient, except in Sorensen (1979) who uses an "expected maturity" coefficient akin to the expected average life of an ABS. That is, he

averages time to maturity and time to call and this measure enters the regression equation with a negative, significant sign.

The dependent variable in these models ("yield") can reasonably be measured in several ways, and this choice has been shown to affect the stability of the regression coefficients. The return on the bond, the dependent variable, can be expressed as the absolute yield, the difference between the bond's yield and some index (the absolute spread), or as a relative measure of yield which involves deflating the difference from the index by the index (the relative spread). The concern that results in the latter specification is that the absolute amount of the yield spread may somehow depend on the level of the index.[1]

Lamy and Thompson (1988) present evidence that the relative yield spread model is a superior specification. The authors refer to theoretical work by Bierman and Hass (1975) and Yawitz (1977) that produce expressions that predict that risk premia are positively related to interest rate levels.[2] Lamy and Thompson empirically test this

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[1]Lamy and Thompson (1988) review the use of these measures in the previous studies. Studies that use the absolute yield include Marr and Thompson (1984) and Sorensen (1979). Studies that use the absolute spread (and the index employed) include Kidwell, Marr, and Thompson (1985; comparable maturity Treasury issues on the day of sale) and Fung and Rudd (1986; a one day lagged Treasury Securities Index). Finally, studies using the relative spread include Benson and Rogowski (1978), Cook and Hendershott (1978), and Billingsley, Lamy, and Thompson (1986).

[2]Notice that this contrasts with the theoretical work of Merton (1974). Utilizing an option pricing framework, he found the term premium or spread of a corporate bond to be a "decreasing function of the riskless rate of interest." In a regression of absolute spread of corporate bonds on (among other variables) an interest rate proxy, Fung and Rudd (1986) find a negative and significant relationship. Rothberg, Nothaft, and Gabriel (1989), examining mortgage-backed securities, find a similar result, which they find "anomalous" (see their note 7). Sorensen (1979), again with corporate bonds, finds a positive and significant relationship.

concept. The absolute spread model demonstrates structural instability as the level of interest rates change--especially the coefficients on default risk premia. The relative spread specification is more stable.

Contrasting with this argument is the argument of Cook and Hendershott (1978). In their example, assuming a constant risk factor, both absolute spreads and relative spreads (the ratio of rates here) move with interest rates. The absolute spread rises as interest rate level rises, the ratio of rates falls. But since the rise in spreads is "approximately linearly related to the rise in yields. . . . an appropriate procedure when estimating risk premium regressions is to use the spread as the dependent variable and the level of rates as an independent variable to capture the effect on the spread of a constant level of risk as yields rise" (p. 1180). Both specifications will be tried in this study.

Mortgage-Backed Security Pricing Studies

A mortgage-backed security such as a GNMA differs from a bond because it is an amortizing security and because it is callable via prepayment or borrower default. Thus, mortgage-backed security pricing models can be viewed as an expansion of bond pricing models. That is, the basic linear model can still be used, but with different independent variables which reflect the special nature of the securities. Credit risk, because of the government guarantee, can be virtually ignored. Prepayment risk is a major factor in these models and modelling or proxying for it is a major concern of mortgage-backed studies.

Lacey and Chambers (1985) demonstrate empirically the existence of an option premium in mortgage backed security returns. While GNMA security returns are

dominated by a fixed payment component, a separate option component coexists. Their principal components methodology identifies the existence of the option premium by examining four types of securities; it is found that returns from GNMA futures contracts share orthogonal return characteristics with returns of futures contracts on fixed price securities and futures contracts of option securities.

Given its existence, the pertinent question is how to proxy for prepayment risk in the specification. Because the right to prepay can be viewed as a call option owned by the borrower--the borrower has the right to call (buy) the mortgage at par--researchers have looked to option theory to suggest proxies for prepayment risk. Hendershott (1986) has reviewed the evidence and suggests that prepayment can be reasonably explained by the observed term structure of interest rates and the volatility of spot rates.[3] The intuition is straightforward. A steeper (upward) slope of the term structure implies that lenders (and investors) expect interest rates to rise in the future. The prepayment option on a fixed rate mortgage is not as valuable in a rising interest rate environment. Thus, we should expect an inverse relationship between slope of the yield curve and spread. This

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[3]"[K]nowing the yield curve and the approximate variance of spot rates is sufficient to price alternative mortgage features" (p. 505). It might seem preferable to use option pricing methodology to price the call. Theoretical mortgage-backed valuation models do employ option pricing theory to price the prepayment and default options (see, for example, Kau, Keenan, Muller, and Epperson (1990) or Schwartz and Torous (1992)). The problem is that most popular models are enormously complex, do not have closed form solutions, and require extensive numerical simulations. In truth, according to Hendershott and Van Order (1987), "few studies attempt to obtain realistic price estimates and even fewer compare estimates with market prices." Also, Milonas (1987) has contrasted option pricing methodology with linear regression models. He notes that option pricing techniques overestimate the value of the call because such techniques assume an optimal call policy not practiced by these borrowers. Schwartz and Torous (1989) allow for non-optimal prepayment in their valuation model and show that it fits the data better than assuming an optimal call policy.

relationship follows from option pricing theory, which indicates that the value of a call increases with the market value of the underlying security or asset. The market value of a mortgage is equivalent to the present value of future payments, which is inverse to interest rates. Thus the negative relation between interest rates and the value of the call. Also, option theory tells us that volatility increases the value of a call. Intuitively, a more volatile interest rate environment increases the probability of low rates in the future, thus increasing the probability of prepayment, the value of the call, and the risk premium in the spread.

The theoretical models from the mortgage pricing literature generally support Hendershott and have implications for this study. Among the more important are Dunn and McConnell (1981), Brennan and Schwartz (1985), and Hall (1985). Dunn and McConnell (1981) attempt to document the effects of the amortization and call (prepayment) features on the pricing of mortgage backed securities in comparison to non-callable, non-amortizing bonds. They utilize an interest contingent pricing model with a single state variable based on models developed by Brennan and Schwartz (1977) and Cox, Ingersoll, and Ross (1978) in order to model GNMA securities. Specifically, they model the effects of the call feature (optimal prepayments), amortization structure, and suboptimal prepayments (caused by default, refinancing for equity, or sale without the buyer assuming the mortgage) on the pricing, returns, and risk of GNMA securities. GNMA's are, of course, default free. GNMAs differ from ABSs in several areas; for example, all loans in a pool are required by GNMA to have the same coupon interest rate and term to maturity and each is insured by the FHA or VA. However, Dunn and

McConnell's model and simulations are directly relevant to this study because of the light they shed on the differences between amortizing and non-amortizing and between callable and non-callable securities. Non-optimal prepayments are not truly an issue because Dunn and McConnell assume that all suboptimal prepayments (including default) are uncorrelated with all relevant market factors, are therefore unsystematic, and can be costlessly diversified away.

Dunn and McConnell's model suggests that as the slope of the term structure goes from negative to positive,[4] the price (yield) of an amortizing, non-callable security decreases (increases) relative to a non-amortizing, non-callable security. This occurs because the later cash flows of a non-amortizing security are discounted more at higher interest rates, likely in a flatter yield curve environment (the instantaneous risk free rate is used as the discount rate in their model). This suggests, contrary to the negative relationship between spread and yield curve slope suggested above, that the spread of an amortizing, non-callable security from a non-amortizing, non-callable security such as a Treasury bond should be a positive function of yield curve slope. Thus, if the call option is not a dominant concern in pricing of an ABS, we should expect to find a positive relationship between the slope and the ABS pass-through spread from Treasury. The prepayment call option implies a negative relationship between spread and slope of the

[4]Although Dunn and McConnell employ a single state variable model, they run simulations under different term structure environments. They can do this because the absence of arbitrage in their model implies that the expected excess return per unit of risk is the same for all interest-dependent securities and thus their risk adjustment term (qr) is the same for all maturities, including infinity. Thus they can assume various long-term interest rates $R(\infty)$ and solve for q, a risk-adjustment parameter that is in their model. However, as Brennan and Schwartz indicate, this method assumes the variance of $R(\infty)$ is zero.

term structure; the amortization feature implies a positive relationship between spread and slope. For ABSs, we have to see empirically which dominates.

Also, their model predicts that amortizing securities are slightly less sensitive to interest rate fluctuations than non-amortizing securities, again because the cash flows come sooner for an amortizing security. Furthermore, the value of callable securities are less sensitive to interest rate fluctuations than non-callable securities with the same maturity. This interesting phenomenon occurs because the values of the call option and a noncallable security both decrease as interest rates increase. The value of a callable security is simply the value of an equivalent non-callable security less the call. This difference is moderated because the two differencing values move together with interest rates. Thus, according to the Dunn and McConnell model and simulations, the pass-through structure, which is fully amortizing and exposes the investor to more prepayment risk, would be expected to possess a less positive relation with interest rate volatility than the more protected structures of controlled amortization, bullet, or bond.

Lacey and Chambers (1985), discussed above, point out that Dunn and McConnell's one state variable model (instantaneous riskless rate of interest) is too restrictive; Lacey and Chambers' results indicate that the return generating process of the mortgage backed security responds to more than one source of uncertainty. Although the principal components methodology they employ does not identify such a state variable, the author's suggest interest rate variability as a likely candidate.

Brennan and Schwartz (1985) echo Lacey and Chambers by showing with simulations that the two state variable model values the option better than the single state

variable model (i.e., Dunn and McConnell). Brennan and Schwartz use the instantaneous riskless rate and the return on an infinite maturity consol (the authors are specifically implying that yield curve slope is important). In comparison to their two state variable model, the single state variable model underestimates the value of the call option. Brennan and Schwartz's more accurate valuing of the call option properly simulates what occurs as the slope of the term structure increases--the GNMA gains in value (reduces promised yield) relative to the Treasury. This supports the negative relation between slope and spread that we expect when the call feature dominates the amortization feature. Further, Brennan and Schwartz's simulations support Dunn and McConnell's notion that amortizing, callable securities are less sensitive to interest rate fluctuations than a Treasury bond (non-amortizing, non-callable)--but only if the interest rate being measured is the long-term interest rate. If it is the short-term rate that is measured, "quite the opposite relation holds" (Brennan and Schwartz, 1985, p. 224). This is because the GNMA behaves more like a short-term security. This is important, because ABSs would be expected to behave even more like short-term securities. Thus, according the Brennan and Schwartz's model and simulations and contrary to Dunn and McConnell's, the pass-through structure would be expected to possess a more positive relation with interest rate volatility than the more protected structures of controlled amortization, bullet, or bond.

Hall (1985) uses a two-state option pricing (binary) model to value the prepayment option on a mortgage. He finds in simulations that the current level of interest rates has little impact, but that the value of the option is negatively affected by the market's view

of the "direction of drift" of interest rates and especially and positively by the volatility of expected future interest rates.

Empirical studies have supported the notion that interest rate volatility and yield curve slope do proxy for the value of the prepayment call. Rothberg, Nothaft, and Gabriel (1989) have utilized these proxies for prepayment risk in their study of the relative yield spreads on mortgage pass-throughs. They find that both interest rate volatility and the slope of the term structure significantly affect the magnitude of the spread and are of the proper sign. In fact, they are the primary determinants (their measure of marketability is not significant), thus lending some support to Hendershott's conclusion that these two proxies effectively capture the prepayment risk.

Milonas (1987), like Rothberg, Nothaft, and Gabriel, utilizes a linear pricing model to assess the determinants of the GNMA-Treasury spread. He utilizes both absolute spreads and relative spreads with similar results. His pricing factors include proxies for the prepayment option (current interest rate level, secondary market rates on FHA mortgages, slope of yield curve (10 year Treasury less 3 month Treasury), and interest rate volatility) and supply and demand variables (applications for GNMA's, number of GNMA pools issued in a month, and new housing starts). He also finds the term structure to be negative and significant. However, the volatility measure is only used in a regression not shown, and is insignificant. Interestingly, the level of interest rates has a negative coefficient and is "the major determinant of the yield spread," presumably for both the absolute spread model (shown) and the relative spread model (not shown). The

number of GNMA pools issued in a month is not significant and is positive, not the expected sign.

Arak (1986) finds that the factors that significantly affect GNMA-Treasury absolute spreads are the slope of the yield curve (negatively), interest rate volatility (positively), and the amount of adjustable rate versus fixed rate mortgages issues, a supply proxy (negatively, i.e., as the amount of variable rate increases relative to fixed rate, the yields on fixed rate GNMA decline). Arak hypothesizes that prepayment risk may be linked to interest rate levels (the sign would vary depending if it was a premium or a discount security), but the coefficient on this variable is insignificant. It should be noted that the borrower, in addition to the option to prepay, also has the (put) option to default. In a guaranteed mortgage-backed setting, when the mortgagor defaults on the mortgage, the issuer is obligated to prepay to the mortgage-backed investor. This is a timing risk that to the investor looks identical to regular prepayment risk. Optimally this option should also be priced. Unfortunately, as Hendershott (1986) points out, valuing this option in reality is very difficult because of unobserved values (the house price), unknown rents (the value of future "dividends" in option pricing parlance), and an unavailable series representing the volatility of individual house prices.

Epperson, Kau, Keenan, and Muller (1985) attempt to price the default risk in mortgages themselves. The prime determinants are the volatility of the house (collateral) price and the volatility of the spot interest rate. Kau, Keenan, Muller, and Epperson (1987) include the value of the default option in their pricing model for commercial mortgages and mortgage-backed securities. (Other independent variables include

uncertain future property values, a continuous term structure of interest rates, the value of the scheduled payments, and the value of the prepayment option.)

Schwartz and Torous (1992) include the possibility of default on the underlying loans in a two state variable, proportional hazards model of mortgage pass-through securities. Default is important to the value of the mortgage backed security even when principal is insured ("default free") because it affects the timing of cash flows. Prepayment and default by the borrower result in an identical outcome to the insured mortgage backed security holder--prepayment of principal. However, Schwartz and Torous emphasize that such decisions by the borrower are taken under different economic circumstances. Specifically, default dominates prepayment when both of the following conditions hold: the value of the underlying collateral is less than the value of the mortgage and the value of the underlying collateral is less than the principal outstanding. The value of the mortgage is the present value of all future scheduled payments, which is different than the principal remaining. If these conditions do not hold, prepayment dominates default. The mortgage value is dependent on time to maturity, the value of the collateral, and interest rates (here the instantaneous riskless rate of interest); the mortgage value is inverse to interest rates, ceterus paribus. Thus default would be expected to increase as the value of the collateral decreases (declining neighborhood conditions, "bad" economic conditions, etc.) or as interest rates decline. In simulations, Schwartz and Torous show that as interest rates increase, the value of the mortgage, insurance (the put option), and the mortgage-backed security all decrease, all else equal. However, at high interest rates the value of the mortgage backed security may not decline if the value of

the collateral is low enough. This is because security holders desire default and the resulting prepayments because of reinvestment opportunities. Nonmortgage asset-backed securities, where collateral value is much less likely to hold its value (consider mobile homes or automobiles), may be likely to exhibit such a relation to interest rates. Interest rate level and a measure of economic conditions, then, may be important to yield spreads. In bad economic conditions, as the probability of default increases, investors would require a higher yield to compensate for earlier than expected (or modelled by the issuer) cash flows; but at high interest rates, such defaults may be desired, lowering required yields.

Empirically, Vandell and Thibodeau (1985), using a logit model, more specifically try to identify the factors which increase the probability of mortgage default. Their data consists of a cross-sectional time series of 348 conventional fixed rate loan histories from the Dallas area covering 1972-83. Explanatory variables include specific loan variables (such as loan to value, payment to income), financial variables (such as corporate bond returns, prime rate), borrower characteristics (such as marital status, employment history), and housing market and general economic conditions (rental costs, neighborhood rating). In addition to the specific loan variables, the only other significant factor was their proxy for general economic conditions--specifically a "neighborhood" rating (a 1/0 indicator variable). Thus, there is some evidence that economic conditions, although in this study fairly localized, contribute to the probability of default.

Pricing default risk or more specifically proxying for it is difficult at an aggregate, non-individual level. Fortunately, as Hendershott points out, empirical work has shown

that the call dominates the put, indicating that ignoring the put option is less serious than ignoring the call would be. However, the above studies indicate or at least suggest the possibility that general economic conditions may proxy somewhat for default risk.

In summation, the mortgage-backed pricing literature provides indications of how prepayment (call), default prepayment (put), and amortization should affect the ABS spread from Treasury. Effective proxies for prepayment risk have been shown to be the slope of the term structure and the volatility of interest rates. If prepayment is an important concern, the spread should have a negative relation with the slope of the term structure and a positive relation with interest rate volatility. However, the amortization feature implies a positive relation between spread and the slope. For MBS, the call (prepayment) has been found to dominate. The empiric results here will illuminate the importance of prepayment risk with ABSs. Default caused prepayment risk may be proxied by a measure of economic conditions; such a proxy should have a negative relation with spread. There are some arguments that both prepayment risk (Arak, 1986) and default caused prepayment risk (Schwartz and Torous, 1992) may depend on interest rate levels, but there has been little empirical support for either argument.

Asset-Backed Security Literature

While the bond pricing literature and the mortgage-backed literature provide a useful base for developing a pricing model for ABSs, nonmortgage asset-backs are more complex than either bonds or mortgage-backs and require additional pricing considerations. While there have been no pricing studies of ABSs, there is an extensive literature on ABSs which illuminate these additional considerations.

Bryan (1988) describes ABSs in revolutionary terms; he sees ABSs as a key to transforming the entire banking industry:

> [Securitization] is better on all counts than the traditional lending system. It is growing very rapidly precisely because it is the superior technology--one that, in fact, is rendering traditional banking obsolete. . . . We estimate that it will take 10 to 15 years for structured securitized credit to displace completely the classic banking system (Bryan, p. 65).

Further, "[s]ecuritized credit combines elements of traditional lending with elements of traditional securities, but it also involves processes and structures not conceived of in either traditional system" (Bryan, p. 70).

Specifically, he identifies four financial innovations that have been used to convert loans into ABSs. The first, the creation of special purpose vehicles (the entity established to purchase the pool from the originator and actually issue the securities), is important because the SPV's "purpose is to isolate the risks inherent in the loans placed in it from all the other risks of the funds raiser [i.e., the originator]" (Bryan, p. 72). This innovation is significant, because if true than the financial condition of the originator should not matter to investors in the securities. This separation or "bankruptcy remoteness" is an oft-cited advantage of ABSs. However, as will be further explored in the next chapter, investors may be concerned about the financial condition of the originator if this condition affects the pool quality and the credit rating does not capture all pool quality effects, or if the originator is also the servicer of the pool.

The second innovation is the pooling of borrowers, which diversifies credit risk. This pooling, of course, is also an attribute of MBS. However, the third innovation, credit structuring and enhancement, is more unique to ABSs because there is usually no

government guarantee of any sort. The guarantor assesses, underwrites, and guarantees the credit risk, usually with the intent of raising the security to investment grade. This allows investors, such as pension funds or individuals, to invest in these securities even though they may have neither the skill nor desire to assess the credit risk themselves. This would imply that if the resulting rating is a sufficient indicator of credit risk, investors would not care about the amount or specific form of the enhancement. However, investors may care about the enhancement if the rating does not capture all of the potential risks to the investor resulting from underlying pool quality or type of enhancement.

The final innovation is the repackaging of cash flows. This is most familiar in MBS with the CMO, a sequential-pay series of tranches, or the senior-subordinate structure. This allows the packager (investment banker who structures the issue) "to tailor the cash flows of the different tranches to particular investor preferences . . . [and] also allows the packager to create tranches with different prepayment risk characteristics" (Bryan, p. 73). However, MBS pricing studies have not attempted to model these different tranches--they concentrate on the more homogeneous GNMA pass-throughs. The ABS sample in this study (described in Chapter 5) allows a separation of tranches into pass-through, controlled amortization, bullet, and bond. We would expect the more structured and certain cash-flow structures to exhibit different responses to the prepayment proxies.

Thus, Bryan's discussion of securitization innovations has illuminated three additional areas of concern in developing a pricing model for ABSs. The effective

separation of originator and issuer, the sufficiency of credit rating, and the ability of the various cash flow structures to combat prepayment risk.

Boemio and Edwards (1989), both members of the Federal Reserve Board's Division of Banking Supervision and Regulation, delineate the risks that investors in ABSs face. Investors face credit risk, that obligors may default on principal and interest payments. More importantly in the current context, investors face "the risk that various parties in the securitization process, for example, the servicer or trustee, will be unable to fulfill their contractural obligations" (Boemio and Edwards, p. 663). To the extent that a single organization performs several roles in the securitization process, investors face a concentration risk of overexposure to a single organization. Boemio and Edwards also indicate the possibility of "moral recourse," where originators, especially banks, may face pressure to repurchase "securities backed by loans or leases they have originated that have deteriorated and become nonperforming" (Boemio and Edwards, p. 664). Thus, implications of the authors' analysis are that credit rating will be important to ABS investors, but also that the originator may matter either because of its role as servicer (operational and concentration risk) or because of some implicit moral recourse.

Goldberg and Rogers (1988) offer three areas of concern for investors when evaluating an ABS: the characteristics of the collateral, the structural features of the security, and the type and amount of credit enhancement provided. Collateral may matter because of geographic diversity of the pool, whether the loans are secured by assets (auto loans versus credit card receivables, for example), and because of different prepayment risk profiles. While "virtually all ABS collateral have some degree of prepayment

uncertainty" (Goldberg and Rogers, 1988, p. 22), the gains from prepayment on ABSs are limited by the short maturity and relatively small size of most ABS loans. However, some ABS collateral, such as credit card receivables, have inherent payment uncertainty because of a lack of fixed payment schedules.

The security structure is important to investors because of the independence of the seller from the originator, the restructuring of cash flows, and the possible elimination of prepayment risk. The creditworthiness of the originator should not affect the rating of a properly structured ABS. However, the authors feel that investors "should distinguish between external credit enhancement and internal credit enhancement" (Goldberg and Rogers, p. 23). This is because with external or third party credit enhancement, the rating of the ABS is subject to the "same risk of downgrade as the provider of the credit enhancement." ABSs with internal credit enhancement, on the other hand, "will be downgraded only if the quality of the collateral deteriorates significantly in relation to the remaining credit support." Thus, the Goldberg and Rogers discussion suggests that at least some types of collateral may be priced differently from others, that cash flow structure is important, especially as regards prepayment risk, and that investors may distinguish among types of credit enhancement.

Similarly, Keighley (1993) lists four major areas of risk in an ABS issue: credit risks, structuring risks including "the effectiveness of legal transfer of title of the assets" (Keighley, p. 99), operational risks such as the continuing effective functioning of the servicer, and financial risks "deriving from unexpected cash flows, such as pre-payments, delinquencies" (Keighley, p. 99). Thus, Keighley echoes the above studies, and suggests

that investors may price default risk, prepayment risk, and default prepayment risk. In addition, pricing of the originator's condition may reflect concern with operational risk (if the originator is the servicer) and/or a concern over the effectiveness of the legal separation of originator and issuer.

A final aspect that may be expected to effect ABS pricing is the newness and maturation of the market. Barmat (1990), for example, feels the pricing of ABSs "has evolved since the earliest issues. Initially, due in part to their novelty and similarity to certain types of mortgage-backed debt, the yield of asset-backed securities in terms of spread to Treasury bond yields was relatively high. . . . these spreads have trended down since mid-1987 . . . reflecting, among other things, increasing investor acceptance of this type of security" (Barmat, 1990, p. 20). Some investors agree that wide spreads reflect some premium for inexperience. Money manager Lawrence Harris of Alliance Capital says: "Maybe that's why spreads are so attractive. They're paying us to take the risk of inexperience" (in Sweig, 1989, p. 537). Thus, anecdotal evidence would imply a narrowing of spreads over time. However, Barmat also points out that many new issuers have entered the market and there has been a "significant broadening of the asset-backed market according to asset type" (Barmat, 1990, p. 20). This broadening process might imply a widening of spreads over time because these new originators and collateral types are probably less well known to investors. Lawrence Harris also said, "There's a sort of knee jerk reaction on the part of a lot of people . . . these things are new and I'm not sure I understand them . . . It just takes time to overcome that" (in Sweig, 1989, p. 546). It may be in fact that investors didn't completely understand them, that the "true" risks of

ABSs may have been greater (or lesser) than the inexperienced market first estimated. Thus, detangling the time trend may prove of interest in understanding the development of this market.

CHAPTER 4
ASSET-BACKED SECURITY RISK FACTORS AND HYPOTHESES FOR PRICING

As was made clear in the earlier discussion, ABSs are a rather heterogeneous collection of securities, varying by collateral, cash flow structure, expected average life, issue size, and type and amount of credit enhancement. This heterogeneity adds a level of complexity to a pricing model. Like mortgage-backed securities, ABSs differ from Treasury securities because of the additional call/prepayment option, because of payment frequency, and because of their amortizing features. Like corporate bonds, ABSs differ from Treasuries because they are not guaranteed by the government and carry varying credit/default ratings. However, the basic risk factors in ABS pricing are familiar from the previous literature discussion; the model's complexity derives from accounting for the varying cash flow structures, subordination, and collateral.

ABSs can be viewed as amortizing bonds with embedded options; thus it is useful to analyze the pricing factors of ABSs by first examining the option components of the securities. These options, held by the insurer and the borrowers, are valuable and expose investors to default risk and option induced interest rate or reinvestment risk. Then, because ABSs involve the repackaging of illiquid assets into liquid assets, the features of the issues and of the market that might influence marketability or liquidity are analyzed.

SPREAD, measured as either the absolute spread (the difference between the expected yield on an ABS tranche and a Treasury of like maturity (i.e., equal to the

expected life of the tranche)) or the relative spread (absolute spread divided by the Treasury of like maturity), would be expected to increase with an increase in default risk (DEFRISK) or option induced interest rate or reinvestment risk (OPTRISK), and decrease with an increase in marketability (MKT). In addition, the absolute spread (+), and possibly the relative spread (-), may be a function of interest rate level (I) (Cook and Hendershott, 1978).

$$SPREAD_i = f(\overset{+}{DEFRISK_i}, \overset{+}{OPTRISK_i}, \overset{-}{MKT_i}, \overset{\pm}{I_i}). \quad (1)$$

A discussion of these factors (and proxies included in the model) follows. In addition, the complexity of these securities and the heterogeneity of the market suggest other factors or characteristics may matter to pricing. Therefore, this chapter contains discussions of the sufficiency of credit rating, what other features may be important, and possible effects of differences in collateral. Credit rating may be an important but not sufficient statistic for credit risk and investors will seek additional information. Similarly, investors may seek additional information regarding non-credit effects such as undesired cash flow timing changes or interruptions.

Default Risk (Part 1): Credit Rating

The exposure of ABS holders to default risk is reduced by the forming of a diversified portfolio of assets to collaterize the security and the addition of private (nongovernment) insurance in the form of some sort of credit enhancement. Thus, the default risk of the tranche depends on the credit of the insurer for the amount of the guarantee and the amount of enhancement relative to the true quality of the pool (i.e., the percentage of principal guaranteed relative to the level of expected losses). ABSs are

sufficiently enhanced for the credit rating received. But even for a Triple A security, default risk remains. ABS certificate holders are exposed to the risk that the credit enhancer could default. Moody's and Standard & Poor's credit ratings of the tranches are the proxies employed for measuring this default risk. While most ABSs are credit enhanced, the ratings do vary and would be expected to be a major determinant of pricing. A highly rated tranche (AAA) has a small probability of default; lower ratings decrease the value of the security, and increase required yield.

There is evidence that financial risk premia will vary over time. (See, for example, Cook and Hendershott (1978), Engle, Lilien, and Robins (1987), Ferson and Harvey (1991), and Flannery, Hameed, and Harjes (1992) and the literature reviews therein). This is a source of concern in this study because data are aggregated across a seven year period. To help alleviate the problem, a control variable will be employed to proxy for the changing price of risk. This proxy is the difference between Moody's daily seasoned bond yields for BAA corporate bonds minus the yield for AAA corporate bonds. This spread is indicative of the fluctuating price of risk (see Figure 3).

Thus, the amount of default risk (DEFRISK) is a function of the credit rating of the tranche (RATE -) and the price of that risk is proxied by the corporate bond spread (CSPR):

$$DEFRISK_i = f(\overset{-}{RATE_i}, \overset{+}{CSPR_i}). \tag{2}$$

One is tempted to take the issue credit rating as a definitive, all-inclusive measure of risk. However, with an issue as complicated as an ABS, other factors could matter as

well. Robert E. Pruyne, managing director of Scudder Stevens and Clark, says about ABSs:

> Some investors may rely very heavily on ratings, but we don't look at the service ratings that closely. We're not tied to them. We rely on our own homework and assign our own ratings. . . . we tend to be a little harsher than the rating agencies. (in Zweig, 1989, pp. 541-42).

The rating agencies themselves explicitly do not evaluate some aspects of the repayment flow. When rating a structured issue, S&P "ignores the obligor's creditworthiness. Instead, a structured financing rating directly addresses the ability of a specified asset or pool of assets to service payment obligations to the investor" (Standard & Poor's, 1988, p. 19). They examine credit risk (including an evaluation of portfolio quality that includes a review of the originator's credit and underwriting practices, the servicer, and the trustee), cash flow (the ability to fulfill the "promise to pay"), and legal issues (asset ownership and risks associated with the bankruptcy of the seller/servicer). Credit enhancement is assessed in light of these risks.

But payment obligations for a pass-through, say, do not include the timing of the cash flows, because the timing is not an obligation. Stress tests on the issue are run to ensure that in worst case scenarios, principal will be protected. Further, while S&P does consider that there should be "redemption provisions" in case of certain negative events (Standard & Poor's, 1988, p. 23), it does not assess the probability of these provisions being enacted. Redemption provisions include payout events and are viewed by S&P as "safety valves" that minimize credit concerns. They end a nonamortization period prior to schedule if the quality of the portfolio deteriorates substantially. Examples of payout events include a substantial decline in yields, a significant increase in losses, a change in

borrower payment or borrowing habits that could adversely affect portfolio performance, and issuer, trustee, or servicer default. "[T]he rating S&P assigns to a credit card transaction generally does not address the likelihood of any of these early amortization events and their resulting cash flow implications. . . . the rating only addresses the likelihood that investors will receive full return of principal by the 'final' . . . maturity date" (Griep, 1993, p. 138). Moody's ratings are similar: "Moody's further points out that its ratings do not reflect the probability of occurrence of pay-out triggers" (Buerger and Isely, 1989, p. 527, from ASR 8-31-87).

Thus, the agency ratings concentrate on the likelihood of principal repayment and not on the timing of those payments. Whether these features of ABS cash flows not considered in the credit rating matter to pricing depends on how investors feel about the timing of their cash flows. The MBS literature identifies two features of timing, interest related prepayments and borrower default related prepayments. These prepayments affect MBS value because the cash flows are correlated with overall market conditions and thus the effects cannot be diversified away. With insured ABSs, principal payments also occur in connection with "early amortization events" mentioned in the quotations above. If these cash flows are correlated with market conditions, market expectations about them will be impounded in the initial ABS price (spread).

We now turn to an examination of these timing events using a simple option perspective. Using the option framework hopefully leads to a better understanding of the risks actually faced by an ABS investor by (1) separating the risks faced by the investor and by the insurer, and (2) distinguishing the options owned by the borrower from that

owned by the insurer. Then we return to the discussion of the sufficiency of credit rating and what other pieces of information may be utilized by investors to supplement the agency rating.

Option Characteristics of an ABS

Like a corporate bond, an ABS can be valued as the difference between a riskless bond (present value of future certain cash flows) and the value of embedded options. That is:

$$B = PV(F) - V(\text{embedded options}) \quad (3)$$

In an ABS, these options belong to both the insurer and to the borrowers:

$$B_a = PV(F) - V_1(\text{embedded insurer option}) - V_2(\text{embedded borrower options}) \quad (4)$$

where B_a is the value of an ABS.

In terms of loss of principal, the insurer faces the actual default risk from the borrowers (up to the amount of credit enhancement); the investor faces the possibility that the insurer may default on its promise to pay to the investors the defaulted principal (exercise a put option). Thus, the embedded insurer put option represents to investors the possibility of default effects after considering pooling and credit enhancement.

The embedded borrower options are the right to prepay without penalty and the ability to default. The right to prepay is an American call option owned by the borrower to purchase the loan at the face value of remaining principal (exercise price). The ability to default is equivalent to an American put option to sell the collateral to the holder of the loan (insurer of the ABS) for the face value of remaining principal. Because the asset-backed securities are credit enhanced, the resulting cash flows from these two

options are identical to investors (once a loan is classified as in default, the guarantor pays out the remaining principal (assuming the enhancement level is sufficient for the level of defaults), which to the investor appears as a prepayment of principal). However, as Schwartz and Torous (1992) point out, such decisions are taken under different economic conditions. Thus, even though the result may appear the same to the investor, regular prepayment risk and default prepayment risk must be differentiated in the pricing model.

Only the borrower put option has relevance for the insurer. If the borrower defaults, the insurer pays the borrower's unpaid principal to the security holder. When the borrower exercises the call option to prepay, the payments are simply passed through to the investor in a pass-through structure, or, in a controlled amortization, bullet, or bond structure, placed in the guaranteed reinvestment account to earn interest hopefully sufficient to make the future scheduled principal payments.

But both borrower options have relevance to the investor. The call is of concern because prepayments are likely to increase when interest rates decline and the borrower has cheaper refinancing opportunities or, likely with real assets such as automobiles, trucks, manufactured homes, boats, and the like, the borrower pays off the loan when he/she purchases a new similar asset at attractive financing rates. The investor in a pass-through thus faces the interest rate risk of having to reinvest at lower rates. Similarly, prepayments are likely to decline when interest rates rise and the investor would desire prepayments with the resulting opportunity to reinvest at attractive rates. But even investors in a non-pass-through structure have reason to be concerned. Excessive

prepayments faster or slower than expected can affect the timing of the cash flows in the principal payout period of a controlled amortization structure and even extend the single principal payment of a bullet structure into an amortization period. Furthermore, excessive prepayments can trigger an early amortization event for either of these structures, resulting in a payout of principal to investors much earlier than expected. Since these prepayments are likely to be linked to interest rate levels, investors cannot diversify away this risk.

Similarly, borrower defaults that result in insurer paid prepayments to investors will matter to investors if they are linked to market-wide conditions and cannot be diversified away and if these early payments of principal are undesired by the investors. Finnerty (1993, p. 37) suggests that "general economic factors" and "general state of the economy" influence the level of these defaults--a "bad" economy increases defaults. If borrower default probability is linked to the overall economy, it cannot be diversified away. If unexpected cash flows in a "bad" economy cannot easily be reinvested because of a lack of investment opportunities or if the cash flows are received when interest rates are low, then the borrower default put should require a premium by ABS investors.

Valuing the Borrower Options

We know from the comparative statics of the Black and Scholes option pricing model that the value of a call is an increasing function of the value of the assets, the volatility of the asset value, the risk-free rate of interest, and time to maturity. It is a decreasing function of the strike price. And, the value of a put is an increasing function of asset volatility and the strike price, and a decreasing function of the value of the assets

and the risk free rate of interest. Because this is an American put option, the value of the option is a positive function of time to maturity (see Merton, 1990, p. 279). Of course, we do not know the value of the underlying assets or their volatility. Thus pricing the options using Black-Scholes pricing formulas is not possible. However, the previous work in the MBS literature offers insight.

Borrower call option. As evidenced by the considerable work done in the mortgage pricing literature, capturing the prepayment call option is of great importance in mortgage backed pricing models. Whether prepayment is as important to ABSs is an empirical question of this study. Regular prepayment risk (hereafter simply prepayment) is the risk that cash flows may be received earlier or later than expected, i.e., than the prepayment history of the pool or the prepayment model or algorithm used in the yield calculations by the underwriter. When prepayments run higher than expected, security holders face the risk of reinvesting elsewhere the early cash flows received, possibly at a lower rate. The ex ante premium for prepayment arises because they tend to occur precisely when rates are low. Thus, the security holder faces interest rate risk. When prepayments run slower than expected, the security holder faces the problem of liquidating outstanding securities at a lower value. That is, expected payments have not been realized; if the investor has cash requirements (for example a pension fund), then the securities must be sold. Thus prepayment is a valuable option held by the borrower and has costs for the security holder.

Acceptable proxies for pricing this call option have been identified in the mortgage-backed literature: the volatility of interest rates and the slope of the yield

curve. The value of the option increases with interest rate volatility and decreases with an increasing yield curve slope as the probability of prepayment in the future decreases if interest rates rise. For MBS, the link between market interest rates and mortgage rates is fairly strong. Thus, the slope and volatility of Treasury rates effectively captures the movement of mortgage rates. For ABSs, the connection is more tenuous, but still viable. The movement of Treasury rates still proxies for the volatility of asset value and provides a yardstick for future refinancing opportunities.

For an ABS, expected average life, akin to the maturity of a bond, could affect the security's initial price and expected yield.[1] MBS pricing studies utilize similar maturity securities (e.g., Milonas [1987] uses 30 year GNMA's). Thus, expected life is the same for all securities and is not in the models used. But, the ABS sample contains tranches of different maturities. Since a call option increases in value as time to expiration increases, expected life should enter positively.

Thus the value of the prepayment call option (CALL) is a function of interest rate volatility (VOL +), the future direction of interest rates (SLOPE -), and the expected life (LIFE +):

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[1]The average life is "the average time to receipt of principal payments (projected scheduled principal and projected principal prepayments), weighted by the amount of principal expected divided by the total principal to be repaid" (Fabozzi and Modigliani, 1992, p. 273). The average life in years is:

$$average\ life = \frac{1}{12} \sum_{t=1}^{n} \frac{t\ (principal\ expected\ at\ time\ t)}{total\ principal}$$

where n is the number of months remaining.

$$CALL_i = f(\overset{+}{VOL_i}, \overset{-}{SLOPE_i}, \overset{+}{LIFE_i}). \quad (5)$$

Borrower put option. The default prepayment option is much more difficult to capture than the call. As with pricing the call, pricing the put directly with option valuation formulas is impossible due to the lack of information on the underlying assets. We can proxy for asset volatility with interest rate volatility. And, as with the call, the value of the option should increase with expected life. However, most other parameters are missing.

The mortgage pricing literature does provide limited evidence that economic conditions provide some indication of borrower default risk. But these economic factors tend to be localized, such as the neighborhood condition of Vandell and Thibodeau (1985, see MBS literature review in Chapter 3). Asset-backed pools tend to be geographically broad, making the collateral value less dependent on location. Thus a broader economic measure is needed, akin to Finnerty's (1993) "general state of the economy." Note that general economic conditions might influence both regular prepayment (call) and the prepayments resulting from borrower default. But the effects should be opposite--a "bad" economy lowering prepayment incentive and increasing defaults. Thus a negative relation between the state of the economy and spreads may imply a premium for default prepayment risk if the unexpected cash flows cannot be easily reinvested because of a lack of investment opportunities in a poor economy.

The proxy employed here will be the previous six month percentage change in the index of industrial production, although numerous national indexes and time periods

perform similarly.[2] The problem with such a measure, of course, is that it presumably captures much more than a default effect, but also especially supply and demand effects. But if those effects are sufficiently captured by the other variables (issue dollars, interest rate volatility, interest rate level, and so on) then this economic condition proxy may be useful.

The value of the borrowers' option to default (BPUT) depends on economic conditions (ECON -) and expected life (LIFE +):

$$BPUT_i = f(\overset{-}{ECON_i}, \overset{+}{LIFE_i}). \tag{6}$$

Effects of Cash Flow Structure

Amortization level. Adding complexity to the functional relationships of the borrowers' call and put is that not all ABSs have pass-through structures. Controlled amortization, bullets, and bonds have progressively more certain cash flow streams. These structures should be less affected by prepayments, but they are not immune to the effects, as discussed earlier. The principal payment stream over the controlled amortization period could be affected by prepayments. The principal payout date for any bullet--soft or hard--could be affected as well, resulting in an amortization period

[2]Other proxies tried were the composite index of leading indicators, the University of Michigan Index of Consumer Expectations, the ratio of consumer installment debt to personal income, the unemployment rate, percentage capacity utilization, and the change in the NYSE composite price index. All of these were available in Kolb and Wilson, 1993. While most of these proxies performed similarly, the percentage change in the Index of Industrial Production entered with more significance and performed consistently. Logically it might seem that a measure more inclined toward measuring consumer confidence might be an effective proxy, because so many ABSs are collateralized by consumer loans. But it was felt that it is not consumer confidence or expectations that matter so much as the aggregate consumer economic situation, which might be effectively captured by industrial production.

following the predicted payout date (see Chapter 2, fn. 20). In order to account for these perhaps differing prepayment effects on the various structures, interactive variables are created by using structure dummies for controlled amortization, bullet, and bond combined with the prepayment proxies.

However, we would not necessarily expect prepayment risk to be as important to the pricing of an ABS as to an MBS. This is because the expected lives are generally much shorter and because the incentives to refinance are not nearly as significant. Prepayment patterns for auto loans and credit card receivables "are generally more stable than residential mortgage prepayment patterns" (Finnerty, 1993, p. 36). In fact, prepayment risk may not be an important factor at all, although this may depend on the collateral involved. (Home equity loans, for example, are often refinanced when the home is refinanced.) Dunn and McConnell's (1981) simulations show that as the slope of the yield curve increases, the yield of an amortizing, non-callable security increases relative to a non-amortizing, non-callable security. If an ABS pass-through is considered an essentially non-callable security (i.e., the prepayment option is not a significant pricing factor), then we would expect to find a positive relation between the slope of the yield curve and the spread between an ABS pass-through and a Treasury security. This is simply a way of saying that ABSs might exhibit positive convexity, like corporate debt, rather than negative convexity like mortgage-backed securities. By extension, there should be a predictable relation between the fully amortizing ABS pass-through and the progressively less amortizing ABS structures of controlled amortization, bullet, and bond. That is, the slope coefficients for these structures should be progressively less positive.

This is really a reinvestment risk problem due to the predicted cash flows, as opposed to the unpredicted prepayments. In the trade press, bullet structures are said to "roll down the yield curve" (ASR, November 16, 1992, p. 4) faster than a controlled amortization structure, for example, and pass-throughs "roll down" slower (ASR, November 23, 1992, p. 1; March 22, 1993, p. 1). The idea is simply that in a steep positive yield curve environment, investors prefer receiving the principal farther out in time, where it produces interest at the higher rate for a longer period. There is less reinvestment/interest rate risk and a greater overall return for a bullet than for a similar controlled amortization issue where principal is received earlier and must be reinvested at a potentially lower rate. In a flat yield curve environment, there is little reward for going long term and investors prefer receiving the principal earlier and facing the prospect of reinvesting at potentially higher rates. Pass-through is preferred to controlled amortization; controlled amortization is preferred to bullet. Thus, because we expect opposite signs on the slope of the yield curve variable, the relative importance of prepayment risk versus reinvestment risk for an ABS or, in other words, the convexity of the security, is a testable hypothesis.

The proxy for default risk will be dummied by structure similarly to the call proxies. In addition to pass-through, controlled amortization and bullets could pay out principal early if an early amortization event is triggered. One early amortization event typically occurs if defaults increase sufficiently to reduce portfolio yield below a base rate set in the prospectus. Since neither Moody's nor Standard and Poor's considers the

possibility of these early amortization events when assigning their issue ratings, this type of "default" risk should indeed be priced separately from ratings.

Subordinate and sequential-pay tranches. In effect subordinate (B) tranches have negative leverage because B security holders own some small percentage of the pool yet face 100% of the loss. The securities might be expected to be more sensitive than senior tranches to the prepayment call option and the default prepayment put option proxies. 'A' tranches in a multiple A tranche issue also face a possible sequential payment situation, and some of them may be more sensitive than others to both types of prepayment. If the splitting up of cash flows into multiple tranches is a more efficient distribution of risk, then A tranches from a multiple A tranche issue may have a yield discount. Thus, both B tranches and multiple A tranches will be represented by indicator variables in the regression, and VOL, SLOPE, and ECON will be dummied to provide interactive variables.

Issue Callability

There is one additional option sometimes present in an ABS issue. The issue may be subject to a call. Callability should matter, as long as the call is not a simple clean-up call which occurs only at the end of the life of an issue when principal outstanding is quite low. Investors should require a premium for callability.

To sum up, option induced risk (OPTRISK) is expected to be a function of interest rate volatility (VOL +), the slope of the yield curve (SLOPE -), overall economic conditions (ECON -), the expected life of the security (LIFE +), and the callability of the tranche (CAL +):

$$OPTRISK_i = f(\overset{+}{VOL_i}, \overset{-}{SLOPE_i}, \overset{-}{ECON_i}, \overset{+}{LIFE_i}, \overset{+}{CAL_i}). \quad (7)$$

VOL, SLOPE, and ECON will be dummied by structure indicator variables to provide interactive variables for different amortization structures and for differences in tranches.

Default Risk (Part 2): The Sufficiency of Credit Rating

Earlier, it was suggested that credit rating of the tranche proxied for the default risk faced by the investor. But, it is not clear that tranche rating is sufficient to assess risk in a complex, heterogeneous market such as the ABS market. There are, potentially, risks not captured by credit rating that may result in default, or more likely, in an early amortization event or some other timing change. "Here, a transaction structure may unwind (i.e., an early amortization event or event of default) due to even the most obscure credit related problem" (Gold and Schlueter, 1993, p. 153). Due to these complex structures, investors may utilize other information in addition to ratings that may be used in the assessment of default risk specifically or, more likely, in the assessment of the probability of undesired cash flow timing changes. Investors are likely to seek additional information that indicates the current and future pool quality and/or that indicates the probability of some sort of structural failure or early amortization event with an issue. A low quality pool or a deteriorating pool increases the probability of future tranche default, prepayments resulting from borrower default, and early amortization events. Structural failure increases the probability of issue default, as well as increases the possibility of an interruption of cash flows. The rating of the originator, the institutional

form of the originator, and the type and amount of credit enhancement may all be considered.

The "bankruptcy remote" structure of an ABS would imply that the originator's credit rating should not be important to the pricing of an ABS if the legal separation between originator and actual issuer is believed to be effective. After all, unlike a bond issue where the rating generally cannot be higher than the originating corporation's credit rating, the "bankruptcy remote" structure of asset-backed issues allows this to commonly occur. In fact it is an important reason a number of large originators such as Chrysler or Citicorp have used the ABS market to fund assets. But despite the claims of "bankruptcy remoteness," there may be legal risks associated with these asset transfers: "experienced investors know that some of these provisions (e.g., nonpetition agreements) may not be enforceable, that no entity can be made truly 'bankruptcyproof,' and that consolidation cannot be judged by some 'safe harbor' checklist alone" (Buerger and Isely, 1989, p. 525). Due to ambiguities in the language of U.S. Bankruptcy Code and an absence of definitive case law relevant to legal transfer, there is "the potential of a bankruptcy court to recharacterize the legal transfer which in most transactions had been intended as a sale of assets, to a pledge of assets, or in some cases, void the transfer altogether" (Griep, 1993, p. 136). Thus, there is the risk that "bankruptcy remoteness" may not be effective in all cases.

But even if the issue is "bankruptcyproof," the condition of the originator might still be important for three reasons. First, bankruptcy of an originator might trigger an early amortization event. Second, the originator has value to the pool after the sale of the

assets. The originator's financial condition is important to receivable collateral value, borrower behavior, credit quality, and possibly the quality of servicing. Consider warranties and product servicing. These can be important factors in resale value and recovery value of collateral. (Buerger and Isely, 1989, offer the example of the depressed resale value for Chrysler products during that firm's financial difficulties.) So a bankruptcy by the originator could have repercussions on the value of a pool of assets. Consider also credit card portfolios. Because of the nature of these receivables, the pool consists of revolving credits and depends on new receivables being added to the pool. If an originator is in trouble, it may be difficult to add receivables of the same quality or any receivables at all. The problem is even worse for retail credit cards (issued by a department store, for example) because if a bank fails, the credit card business would most likely be divested and card usage continue. But with a retail card, when the business fails most likely the credit card business would also shut down, resulting in no new receivables.

Third, the originator is very often the servicer, and in "a single originator transaction, it is likely that the originator may manage the SPV," i.e., "managing its debt, interest rate swaps and foreign exchange payments, effecting cash movements, and managing its accounts" (Keighley, 1993, p. 105). The servicing role is especially important. A bankruptcy by the servicer could result in an interruption in the transaction management duties and possible cash flow effects for investors. Worse, it could result in a "permanent diminution in overall credit quality" (Buerger and Isely, p. 517.) These would be effects beyond the historical experience used to estimate delinquencies, defaults

and recoveries. This is because the servicer, through collection procedures and policies, maintains pool quality and can influence payment behavior. Efficient and effective collection procedures are very important. Short of bankruptcy, it is still possible for performance to deteriorate over time. Griep (1993) points out that troubled banks and thrifts experience an increase in delinquencies and defaults. Servicer credit quality is important for an additional reason: the servicer makes cash advances on delinquent receivables and it collects and holds payments. This cash function could be affected by servicer difficulties.

There is evidence that the originator's institutional form--bank, savings and loan, captive finance company, and so on--might also matter to pricing. Previous studies have found some evidence that banks, for example, are different. They may possess special information or ability that other market participants do not, may structure loans differently, or attract (or choose) different consumer clientele.[3] Investors, then, may price issues differently depending on the type of originator.

Finally, how an issue attains its rating may be important. Credit enhancement can be provided via subordinate tranches, outside guarantees, inside guarantees, and many other ways. Can the investor distinguish among these methods and does it matter to

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[3]See Lummer and McConnell (1989) on the positive market response to bank loan renewals. Billet, Flannery, and Garfinkel (1993), in an examination of commercial bank loans, find that while loans from all originators (banks and non-banks) elicit a positive market response, the quality (credit rating) of the lender, rather than the type, positively influences the market's response to a loan announcement. Thomas Zimmerman of Prudential Securities researched home equity loan prepayment speed. He found that the key to prepayment speed was where the borrower is financing. Bank borrowers prepay faster, presumably because they are higher quality, more sophisticated borrowers than those who borrow from finance companies (ASR, May 3, 1993).

pricing? Does the particular form and amount of the credit enhancement tell the market anything in addition to what the credit rating indicates?

There is reason to believe the type of credit enhancement should matter. It has been suggested that certain forms of enhancement are less sensitive to event risk, such as a rating downgrade of the insurer. For example, unlike banks, the most common provider of a letter of credit, no monoline insurer has ever been downgraded (see Mortimer, 1993, p. 179). Also unlike banks, "monoline" insurers are not subject to potential losses from other risk-carrying lines of business. Thus there may be some pricing distinction between letters of credit and outside insurance. Also, a cash collateral account has frequently been lauded as being without event risk altogether, because once the cash has been provided it cannot be downgraded. Finally, a retained subordinate class may offer advantages in either direction. Compared to third party enhancement, the retention of a subordinate piece of the pool might be expected to decrease moral hazard. On the other hand, Bhattacharya (1989) points out that a subordinate piece is not a perfect substitute for other credit enhancement devices:

> In the event of default or foreclosure, other credit enhancement alternatives provide immediate coverage up to the limit protection. However, the ability of the subordinated cash flows to meet shortfalls in the senior class cash flow is limited by the balance of any fund created specifically for the purposes of such contingencies and any current cash flow due to the subordinated holders. (p. 479)

The amount of credit enhancement may be important as well. It may be important to the market if the credit rating does not assess the complete risk of a low quality pool. The rating process on an ABS differs from the process with more traditional securities because it "starts with the rating desired" and the rating agency tells the issuer what is

needed to achieve that (Watson and Joynt, 1989, p. 213). Thus the amount of enhancement may be a direct indicator of pool quality. The quality of the pool, likely to move with the economy and thus be undiversifiable, may be an indicator of the probability of early payout events, and the amount of credit enhancement may be a signal of this quality.

If originator rating, originator institutional form, or credit enhancement are significantly priced, then the sufficiency of credit rating for assessing risk in an ABS might be questioned. Such findings would indicate that credit rating of an ABS issue does not assess all the implications of a low quality pool or weak structure, and therefore the market seeks additional information. The market's assessment of credit risk (DEFRISK), then, may be more than a function of issue rating (RATE -); it may also be a function of originator rating (ORIGRT -), originator type (ORIGTP +/-), and credit enhancement (CE +):

$$DEFRISK_i = f(\overset{-}{RATE_i}, \overset{-}{ORIGRT_i}, \overset{\pm}{ORIGTP_i}, \overset{+}{CE_i}). \qquad (8)$$

Marketability

A prime motivation for the restructuring and repackaging involved in an ABS issue is to transform illiquid assets into liquid or marketable assets. Marketability may be affected by the size of a particular issue or the size of the ABS market, by the experience of investors with ABS structures, collateral, or originators, and by particular issue characteristics such as frequency of payments.

The issue size is a common proxy for the marketability of any particular issue in corporate bond studies (e.g., Billingsley, Lamy, and Thompson (1986), Kidwell, Marr, and

Thompson (1984), Fung and Rudd (1986), Allen, Lamy, and Thompson (1987), and Sorensen (1979)). As the issue size increases, it is likely that the breadth of the market for the securities will expand--there will be more investors holding the securities in their portfolios and thus more regular trading. The expectation, then, is that larger issues are more marketable and require lower yields. There has been a commonly found size effect in bond pricing studies--size usually enters negatively and significantly (e.g., Allen, Lamy, and Thompson (1987) and Sorensen (1979)). Alternative proxies for issue marketability employed in this study are logged dollar value of an issue and the dollar value of the issue deflated by the dollar value of corporate bond issues in the month of issue (corporate bond issues were used because of the obvious time trend in ABS issues over the period).

As a young, maturing market, the ABS market offers an opportunity to explore the relative importance of market deepening versus market broadening over time, and to determine if inexperience in these securities resulted in an initial overestimation or underestimation of risks that was corrected over time. On the one hand, from its beginnings as a public market in 1985, the ABS market might be expected to undergo a deepening process as the instruments in the market get better understood by more investors and the increase in the number of issues increased liquidity.[4] This market deepening would imply a narrowing of spreads over time. Spreads would also narrow if the market's initial estimation of risk was overestimated due to inexperience.

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[4]Money manager Lawrence Harris says: "It's been the same way with every new kind of security that we've seen. It takes a while for liquidity to develop" (in Zweig, 1989, p. 535).

Similarly, two forces might widen spreads over time--a "market broadening" process and a maturation process that reflects a correction for an initial underestimate of risks due to inexperience. Over a relatively short period, the ABS market has absorbed a tremendous increase in supply, has seen a large number of new, perhaps lesser known originators enter the market, has broadened the types of collateral underlying the issues, and has seen introduced a variety of instruments. Because of the rapidity of this growth, the tendency toward the new and unusual, and possibly average collateral quality decline, this broadening trend would be characterized by a widening of spreads over time. If ABS risks were initially underestimated, spreads would also widen over time.

Two alternative proxies for a maturation or time trend that would capture the dominant trend are a simple time count--this study uses a count by quarter with one being the first quarter of 1985--and the logged total dollar value of issues in the entire ABS public market prior to the day of a particular security's issue. Reasons for a significant time trend include a changing composition of issuers, and/or collateral types, and/or security designs, as well as changing risk assessments of stable issuer, collateral, or security designs. Whether any trend holds for individual major originators and homogeneous tranche types as well as the entire market should help determine whether the effect is due to market deepening or broadening, whether it is due to an initial market over- or under-estimation of ABS risk, or whether it is simply due to changes in market composition.

A closely related marketability issue is that of "market saturation" or "hotness," that is, the dollar value of ABS securities currently available in the market. Because

secondary market information is not available, a proxy for market hotness is the logged dollar value of ABSs issued in the previous three months from the day of a particular issue. This quarter issue figure tends to follow an increasing time trend much like the quarter count or logged total issue dollars. Most previous MBS studies expect a negative relation with spread for such a supply variable (see Milonas [1987] and Rothberg, Nothaft, and Gabriel [1989]), but find a positive, insignificant one.

The importance to pricing of investor "experience" with aspects of ABSs can be illuminated more clearly, perhaps, by proxying for experience or inexperience more specifically. First issues by a particular originator or of a particular collateral might require a higher yield.[5] Dummy variables for these issues will be included. The private market, which tends to lead the public market, may mute the negative pricing effect of this type of inexperience in the public market.[6] Similarly, a very familiar, established issuer who has established a reputation might be rewarded by issuing securities with lower required yields. Proxies will include the logged dollar value of all previous issues by an originator and, alternatively, a dummy variable for five or more previous issues. Using either approach, experience may be a priced marketability factor.

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[5]Ken Degen, Vice President of Structured Finance for MBIA, a major insurer, said ". . . we're very cautious in taking on new asset types. To do a new asset type takes a long time. . . . A lot of research and development go into new asset types--on all sides" (ASR, April 12, 1993, p. 6).

[6]Information on private transactions is more difficult to obtain. But Acheson and Halstead (1988) note that a number of public issuers continue to use the private market, including Ford and Chrysler. Also, Pavel indicates in the collateral category of lease receivables, for example, that by June of 1988, there had been almost $1 billion issued publicly. Private issues at that time totalled $500 million, a substantial percentage. ASR reports that private placement ABS issues were $13.06 billion in 1993, a 12% increase over 1992. For 1993, that figure would place private issues at 21.7% of the public market (ASR, February 28, 1994, p. 1).

Finally, specific tranche characteristics may increase or decrease tranche marketability. For example, most ABSs have payments 12 times a year. However, some tranches pay out only two or four times a year. If there is a demand for these less frequently issued payment frequencies, perhaps because of a reduction in reinvestment transaction costs or a better matching of required cash flows for some investors (a clientele effect), then these securities may have a reduction in required premium. On the other hand, if less frequent cash flows are not in demand, we may see the opposite effect.

Marketability (MKT) is a function of market maturation over time (TIME +/-), market saturation or hotness (HOT +-), issue marketability (SIZE -), experience (EXPER +/-), and payment frequency (FREQ +/-):

$$MKT_i = f(\overset{\pm}{TIME_i}, \overset{\pm}{HOT_i}, \overset{+}{SIZE_i}, \overset{\pm}{EXPER_i}, \overset{\pm}{FREQ_i}). \qquad (9)$$

Collateral

Collateral may reflect a great number of differences among issues. Unlike mortgage assets, ABS pools are "characterized by an absence of standardized underwriting and servicing. Consequently, portfolio quality and performance will vary widely"[7] (Standard & Poor's, 1988, p. 71), perhaps across collateral type. Further, underwriting standards could be affected by competition, growth strategies, and marketing methods within an industry. Some industries/collateral-types may face different risks. For example, competition in the credit card industry could affect pool cash flows if competition forces a change in rates or fees. Or government legislation might change

[7]Mastercard and Visa, for example, unlike FNMA, FHLMC, or GNMA, do not require adherence to specific underwriting standards.

pool behavior, for example the change in the tax treatment of interest expense that occurred a few years ago. Goldberg and Rogers (1988) made the further point that some distinctions may be made among collateral types because some securities are collateralized by real assets (e.g., autos) while some are not (e.g., credit card receivables).

Thus, collateral type may be significantly priced because of different characteristics or because they face risks omitted from the model and not captured in the credit rating of the issue.

Summary: Hypotheses Concerning the Determinants of ABS Yield Spreads

Substituting (7) through (9) into (1) and including collateral and interest rate level, we obtain the following model for ABS spreads.

$$SPREAD_i = f(I_i^{\pm}, TIME_i^{\pm}, HOT_i^{\pm}, SIZE_i^{-}, EXPER_i^{\pm}, RATE_i^{-}, COLLAT_i^{\pm},$$
$$ORIGRT_i^{-}, ORIGTP_i^{\pm}, CE_i^{+}, VOL_i^{+}, SLOPE_i^{\pm}, ECON_i^{-}, LIFE_i^{+}, FREQ_i^{\pm}, CAL_i^{+}). \quad (10)$$

The conflicting signs on SLOPE and TIME should be clarified. For SLOPE, a negative sign indicates that prepayment concern dominates, a positive sign indicates that the amortization effect dominates. Zero would indicate that the slope is an ineffective proxy or that the two effects net out. A negative sign on TIME would indicate that the market deepening effect dominates and/or ABS risks were initially overestimated; a positive coefficient would indicate that the broadening effect dominates and/or ABS risks were initially underestimated.

The discussion of the ABS risk factors lead to several testable hypotheses which are evaluated in this study. Except where noted, the null hypothesis is "no effect."

(1) Prepayment risk is a significant pricing factor with ABSs, and this risk diminishes as cash flow structure becomes more certain. Thus, ABSs exhibit negative convexity and the sign of the SLOPE coefficient is expected to be negative. The alternate hypothesis is that ABSs exhibit positive convexity--prepayment risk is not a dominant concern while concern over reinvestment of expected cash flows dominates. The slope coefficient sign is positive and becomes less positive as expected principal payments are pushed out further in the life of the tranche.

(2) Default prepayment risk is an important pricing factor and moves countercyclically with the economy.

(3A) In a new and developing market, market "deepening" dominates and results in a narrowing of spreads over time and/or ABS risks were initially overestimated.

(3B) Market "broadening" dominates and results in a widening of spreads over time and/or ABS risks were initially underestimated.

(4) The market requires a premium for a lack of familiarity or experience such as a first time originator or a new collateral type and discounts for an established reputation.

(5) Investors require information on pool quality in addition to tranche credit rating. In particular,

(5A) Originator rating affects spread,

(5B) Originator institutional form affects spread,

(5C) Type and amount of credit enhancement affects spread.

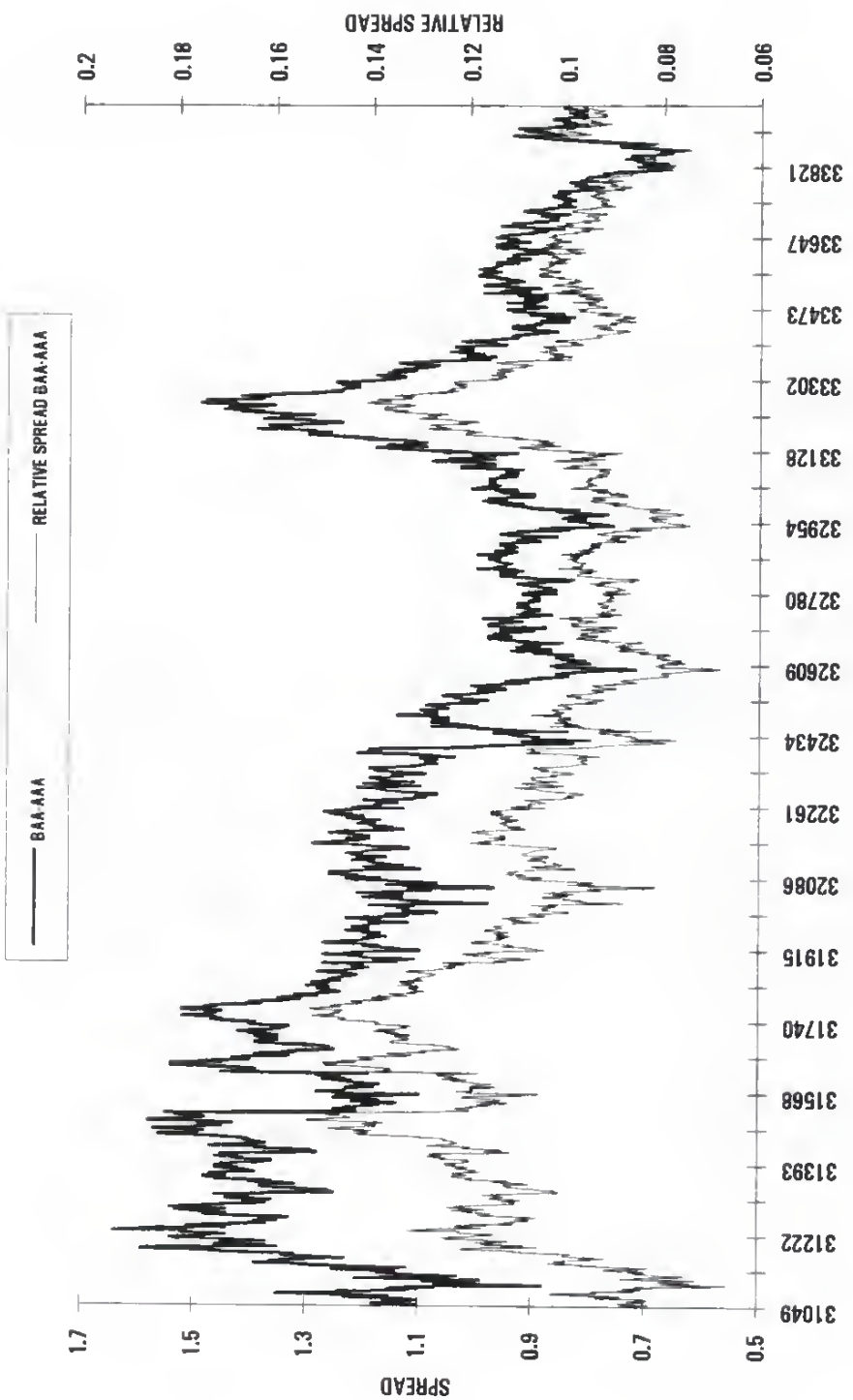

FIGURE 3: CORPORATE BOND YIELDS
SPREADS AND RELATIVE SPREADS

CHAPTER 5
METHODOLOGY AND DATA

The challenge of this study is to construct a model and develop a procedure to price the relevant risk factors that acknowledges the heterogeneous nature of ABSs. The model must allow for possible pricing differences among the different cash flow structures, the level of subordination, the multiple tranche structures, and possibly the major collateral groups. The plan of the study is to present an initial model that highlights the relevant risk factors discussed earlier and, in particular, studies the interaction between cash flow structure and proxies for prepayment and default prepayment risk. Collateral type, subordinate B tranches, multiple tranches, payment frequency, and first by an issuer or first by a collateral type are factored into the model through the use of dummy variables. A time trend is included because this is a new, developing market. OLS regressions are used.

The initial regression establishes the ability of the model to explain a significant portion of the variability in the spread from Treasury. It also assesses the importance of prepayment and prepayment default risk to ABS investors and examines the ability of different cash flow structures to ameliorate the effects of prepayment, prepayment default, and reinvestment risk. Then, similar interactive effects are studied with regard to subordinate tranches and multiple (sequential) tranches.

Further specific hypotheses are then addressed concerning the role of reputation and the originator. The value of experience or reputation is expanded upon (from the "firsts" of the initial regression) by proxying for previous experience in the market. The role of the originator is first examined by adding originator rate to the model. It is further studied by dividing the sample into three major collateral types. Dummies for institutional form are added to the specification. The isolating of collateral not only allows conclusions about why institutional form may be important, it also allows us to assess the degree to which different collateral types face similar risks.

Finally, the role of credit enhancement is studied. Whether how an ABS attains a certain rating matters to investors is analyzed by adding variables representing amount and type of credit enhancement. The market may value enhancement differently by who provides it or by the specific form of the insurance.

The analysis is conducted using both absolute spreads and relative spreads, illuminating the effectiveness of each in capturing the above effects, and perhaps, as well, offering insight into the stability of these different specifications (see discussion in literature review).

Data

This study provides the first extensive examination of a large, fairly complete sample of asset-backed securities. Data on the offer pricing and characteristics of ABSs (seller (originator), issuer, class (tranche), principal, expected average life, collateral, rating, yield, and lead manager) were collected from Asset Sales Report, a weekly

industry publication devoted to loan sales and asset-backed securities.[1] This information was supplemented by detailed data on each issue's call, payment frequency, and payment structure. These data were obtained from two sources: the Warga/Lehman Brothers Fixed Income Data Base[2] and Moody's Bond Record. The latter source also provided tranche cusips (with which to access the Warga dataset), as well as issue ratings and limited information on credit enhancement (usually just indicating the name of an insurer) and payment frequency.[3] Additional information, where required, is sought from the "New Securities Issues" section of the Wall Street Journal and Dow Jones News Retrieval Searches, including unpublished press releases from the various rating firms, insurers, or originators.

Ratings for originators were based on the senior unsecured debt rating from Moody's Bond Record at the time of issue. If unavailable in Moody's, Standard & Poor's was consulted. In just a few cases, where bond ratings were unavailable, Moody's thrift or bank long-term deposit rating was used. Originator ratings are for the parent corporation, not the subsidiary (in consultation with Dunn and Bradstreet's annual Who

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[1]Information from ASR was collected in two ways. Lexis/Nexis carries ASR from 1991 on. Unfortunately, not all of what are called "New Issue Scorecards" are on Lexis (probably because before mid 1992 they were considered tables or charts). Also, the editorial offices of ASR allowed the author to examine their past issues. The author would like to thank Jeanne Burke, editor, for her assistance. ASR is published by the American Banker.

[2]Developed by Arthur Warga of the University of Wisconsin--Milwaukee and based on the Lehman Brothers Bond Indices, this new dataset contains structural information and monthly pricing on fixed income securities. Even though asset-backs are not a primary component, this served as an important source of data for this study.

[3]Until December, 1990, asset-backs were listed (sporadically) with regular bond issues. After this date, ABSs are listed in a section titled "Structured Finance Issues." This section contains no issue yields or secondary market pricing information.

Own's Whom), but in all but a few cases there is no conflict between the ratings of the parent and the subsidiary (e.g., General Motors, not GMAC; Citicorp, not Citibank, N.A.).

Credit enhancement information was gathered primarily from ASR, supplemented by Dow Jones News Retrieval searches of the Wall Street Journal and the various press releases included on this service. This information included type (letter of credit, surety bond, cash collateral, etc.) and amount of enhancement (dollar and/or percentage), the tranche(s) to which it applies, and the provider of the coverage. Moody's Bond Record does not provide dollar or percentage of issue amounts of enhancement, but it does often indicate the type of credit enhancement and the name of the insurer. Thus, this is valuable supplemental information. In general, the credit enhancement information is more complete for 1991 and 1992 (when ASR is carried on Lexis). The information that is contained in the dataset created here is generally accurate and complete, except that details on overcollateralization are scarce. Overcollateralization is commonplace, although usually modest in amount. But details on the overcollateralization are generally available only in the prospectus, which we do not have for most of these issues. Thus generally we do not know the amount of overcollateralization. In two cases only, we know that overcollateralization was the only form of credit enhancement utilized and we know the amount. The overcollateralization amounts for these two issues only are included in the credit enhancement sample.

Treasury rates are from constant maturity Treasury daily series as reported in Table 1.35 of the Federal Reserve Bulletin. Spreads are calculated using a Treasury

security of comparable maturity, creating a term-structure adjusted risk premium. The spreads utilized here will not exactly match the spreads quoted in the press for an issue. There are two reasons for this. (1) Most spreads are quoted as the difference between the ABS yield and the closest available Treasury. By contrast, the spreads in this study use an linear interpolated Treasury rate for the maturity equal to the tranche's average expected life. (2) Yields on ABSs are quoted as CBE (corporate bond equivalent) yields, which are based on semi-annual interest and a 360 day year. Accordingly, constant maturity Treasury rates, based on a 365 day year, are adjusted to CBE by multiplying by 360/365, thus yielding a slightly larger spread. Treasuries shorter than one year are quoted as discount yields. These treasuries are first converted to BEY (bond equivalent yields) based on 365 days and then adjusted by the 360/365 factor.

Yield curve slopes and interest rate volatility are calculated using rates reflecting a 365 day year. The slope of the term structure is calculated as the difference between the yield on the 5 year constant maturity Treasury and the six month treasury bill. Interest rate volatility is calculated as the standard deviation of the yield of the 5 year constant maturity Treasury for a period 30 business days before issue date.

The Index of Industrial Production is produced by the Bureau of Economic Analysis of the U.S. Department of Commerce. It is published in The Survey of Current Business and was collected through mid-1992 on computer disk in Realdata (Kolb and Wilson, 1993).

The following section contains a discussion of the sample of ABSs created for this study.

Sample Description: Entire ABS Sample

Tables 3 through 6 present descriptive statistics on the entire ABS sample collected. As previously indicated, asset-backed securities are a rather heterogeneous lot--which differentiates them strongly from the mortgage-backed market, for example. The full sample (although not the regression sample) is a virtually complete representation of the entire domestic, publicly issued ABS market from its inception in 1985 through the end of 1992, including preferred stock issues, tax exempt issues, and interest-only tranches. The sample contains 503 issues with 725 tranches totalling almost $209 billion.[4] The impressive growth over time of the market is reflected in Table 3. From 7 issues (($1.2 billion) in 1985, the market grew steadily to 111 issues ($54 billion) in 1992.

The majority of the tranches are fixed rate (608), although variable rate tranches (117) have increased in recent years (see Table 4). Few of the tranches are callable (31)[5] and most make interest and/or principal payments monthly. There are 97 subordinate (B class) tranches and 606 non-subordinate (A class) tranches.[6]

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[4]This figure is as close as possible to representing the actual public market for these issues. For example, Gorton and Pennacchi (1992) have issue totals complete through 1988 provided by Goldman, Sachs & Co. My figures compare exactly with their figures for 1985 and 1986. My sample contains six more issues for 1987 and nine more issues for 1988.

[5]The call information, as with the payment structure and frequency information, is from the Warga/Lehman Brothers dataset.

[6]Also categorized are interest-only tranches and preferred stock, which will be dropped from the regressions, and mezzanine. A mezzanine tranche is senior to a B tranche, but subordinate to an A. There are only 5 such identifiable tranches. Mezzanines are included (with B) as credit enhancement to senior tranches.

There are five identifiable payment structures. The majority are simple pass-through (310), but there are also a significant number of controlled amortization (113) and bullet structures (88). There are 12 identifiable soft-bullet tranches; these are combined with the bullets for the regressions. There are only 7 regular bonds. As expected, most tranches (including many B classes) are rated Aaa, but tranche ratings range as low as B2.

Although much of the publicity for ABSs has centered on the variety of collateral being securitized, in truth this is still a market dominated by just a few types of underlying assets. While collateral (Table 5) is wide ranging, three types clearly dominate--credit card receivables, auto and truck loans, and home equity lines or loans. Together, these three collateral categories comprise over 80% of the market. Notice that "credit card retail," such as department store cards, have been distinguished from "credit card receivables" or general purpose credit cards, such as Visa, Mastercard, or Discover. In 1992, credit cards comprised 30.1%, auto loans 31.7%, and home equity 11.3% of the market.

The largest originators over this time period by dollars of securities issued were Citicorp, with 36 issues totalling $30.1 billion, Chrysler with 39 issues totalling $22.8 billion, and Sears with 37 issues totalling $17.6 billion (see Table 2, Chapter 2). Note that all three of these firms have seen some financial turmoil over the sample time period. Chrysler, especially, has clearly been a major player in the ABS market in order to issue securities at a higher credit rating than was available to them in the commercial paper or

bond markets.[7] Banks (more precisely bank parent companies) have been the most active single type of originator, with 190 issues. Captive finance companies, which include GMAC, Ford Credit, and the like, are the second most active type with 149 issues.

The largest single issue was by GMAC for $4 billion in 1986, an issue containing 3 tranches. The largest single tranche was for $2.2 billion, a single tranche issue by Ford Credit in 1989. The average issue (tranche), however, is much smaller at $415 million ($297 million). The average expected average life is 3.4 years, with a range from 0.2 years to 20.5 years. The average expected yield at offer is 8.09%, reflecting a spread over similar maturity Treasury of 1.16%. A tranches, as would be expected, are larger than B tranches ($337 million versus $60.3), have shorter lives (3.1 versus 5.2 years), have lower yields (8.14% versus 8.3%), and have tighter spreads (1.1% versus 1.6%).

The slope of the yield curve, as measured by the difference between the 5 year and 6 month Treasury rates, and interest rate volatility, as measured by the standard deviation of the 5 year Treasury rate over the 30 trading days before an ABS issue, have fluctuated quite widely over the sample period (Table 6, Panel D, and Figure 4). The slope, in fact, ranged from a high of almost 3% in April of 1992 to barely negative slopes in 1989 and 1990. Figure 5 illustrates the movement of the 5 year Treasury rate with the slope of the term structure. They moved more or less together through early-1988 (correlation = 0.81) and they tended to move in opposite directions after this point

[7]See ASR, May 11, 1992, p. 1. "Though it is among the strongest finance companies, CFC [Chrysler Financial Corp.] has been hampered by ratings downgrades attributable to the weakness of its parent, effectively precluding CFC from funding itself in the unsecured commercial paper and debt markets, said Stephen G. Moyer, high yield analyst at Kemper." At the end of 1989, Chrysler had $10.1 billion of commercial paper outstanding, which had plummeted to $339 million by year end 1991.

(correlation = -0.75). Finally, Figure 6 traces the index of industrial production over the sample period. The economy showed steady growth into 1989, where it began levelling off. There were some dramatic fluctuations through the end of 1992, including a steep drop in the second half of 1990 and into 1991.

Regression Sample

The sample used for the initial regression is limited by the requirement for cash flow structure information and the exclusion of preferred stock tranches (15), variable rate tranches (117), interest only tranches (2), and tax exempt issues (5). These were excluded because it is likely that the pricing behavior of these securities would exhibit different characteristics than the remaining sample.[8] For most of the affected tranches, in fact, we lack one or more of the required parameters--expected life or yield. Table 7 presents summary statistics on the regression sample. The data are not significantly different and indicate no systematic exclusion patterns from that presented on all ABS issues in Tables 3 and 6. The regression sample appears representative. Once tranches with missing data are excluded, the regression sample contains 452 tranches, down from the 725 total tranches issued in this period.

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[8]A preferred stock dividend rate is lowered by the 70% dividend exclusion enjoyed by corporate purchasers of preferred stock. Tax exempt issues also have an obvious tax advantage. Variable rate yields are expressed as a spread from some index, generally LIBOR, and they are generally reset every three or six months. Thus, any link between the expected life of the tranche and the expected yield will differ from fixed rate issues. They are effectively a series of short-term securities (with a single transaction cost) which roll-over at the reset intervals. For more on the valuation of floating-rate instruments and their differences from fixed rate instruments, see Ramaswamy and Sundaresan (1986).

The Model

The specification of the initial model is

$$\begin{aligned} SPREAD_i = {} & \alpha_0 + \alpha_1 I_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i \\ & + \alpha_7 IP_i + \alpha_8 RATE_i + \alpha_9 COLLAT_i + \alpha_{10} FIRST_i + \alpha_{11} CALL_i + \alpha_{12} FREQ_i \\ & + \alpha_{13} BDUM_i + \alpha_{14} MULTA_i + \alpha_{15} CSPR_i + \alpha_{16} INTERACTIVES_i \end{aligned} \quad (1)$$

where

SPREAD = Absolute spread calculated as expected yield on issue i minus the yield on a U.S. Treasury issue with a comparable maturity at the time of issue. When no matching maturity is available, linear interpolation is used. For the relative spread specification, the spread is divided by the interpolated treasury yield.

I = Interest rate level, five year constant maturity Treasury bond on the day of issue. The coefficient is expected to be negative.

VOL = Interest volatility, the standard deviation of the annualized yield of the five year constant maturity Treasury for a period 30 days before issue date.[9] The coefficient is expected to be positive.

SLOPE = the slope of the term structure calculated as the difference between the yield on the 5 year constant maturity Treasury and the six month Treasury bill.[10] The coefficient would be expected to be negative if prepayment risk is a significant factor.

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[9]The 30 day period is somewhat arbitrary. Rothberg, Nothaft, and Gabriel (1989) used this period and found it significant in explaining the spread on mortgage pass-throughs. It assumes market expectations of interest rate volatility are based on recent experience. The measure employed here was chosen because it is simple, direct, and produced adjusted R Squares at least as good as any alternative measure. Five other measures were substituted with very little effect on the model. They were the absolute mean variation in the 5 year Treasury for periods of 10 and 30 days previous to issue; those absolute mean variations deflated by the five year Treasury rate on the issue day (as employed by Chatfield and Moyer [1986]); and the standard deviation using log differences for 30 days previous (as employed by Rothberg, Nothaft, and Gabriel [1989]), again using the 5 year Treasury.

[10]In mortgage studies, the 10 year treasury is most often used. However, the rule of thumb there is average life of 12 years for mortgages. ABSs have shorter expected average lives, so 5 years was selected as the far end of the pertinent yield curve. Slopes measured as the difference between the 10 year and 6 month Treasuries and the difference between the 5 year and 3 month Treasuries were also utilized with similar results.

LIFE = Expected average life, logged, measured in years.[11] If risks such as prepayment and default increase with time to maturity, the coefficient will be positive.

SIZE = The dollar size of the issue, logged, a proxy for liquidity--larger issues are expected to be more liquid. It has been demonstrated generally in bond pricing studies that large issues tend to carry a lower yield.[12]

TIME = A numeraire to indicate time trend for market deepening or market broadening, measured by a quarter count with one being the first quarter of 1985.[13]

IP = The state of the economy, represented by the previous six month percentage change in the index of industrial production. The coefficient is expected to be negative.

RATE = Dummy (1,0) variables for the issue's credit rating, a proxy for default risk. The higher of either Moody's or S&P is used, if there is a conflict.[14] Aaa is the omitted rating (captured in the intercept). Dummy rating groups are Aa1/Aa2, Aa3/A1, A2, A3 and lower. The rating dummies should enter positively.

COLLAT = Dummy (1,0) variables for the type of underlying asset of the issue. The sample is divided into 8 groups, with credit card receivables the omitted group (i.e., captured in the intercept). The other categories are credit card retail, auto/truck loans, home equity loans, manufactured housing/mobile home loans, miscellaneous commercial, and miscellaneous retail.

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[11]There are two maturity dates for every class--expected maturity date and final maturity date. The final maturity date is the actual final maturity of the underlying collateral. This ignores prepayments which are expected and fairly predictable. The expected maturity date incorporates expected prepayment and is the date, on average, investors can be expected to be repaid. This date will be used in the analysis.

[12]An alternate proxy employed is the dollar value of the issue deflated by the dollar value of corporate bond issues in the month of issue. There is no change in the results.

[13]The logged dollar volume of all issues in the market up to, but not including, the day of issue was also used, with very similar results.

[14]Note that Ederington, Yawitz, and Roberts (1987, p. 225) cannot reject the hypothesis that "Moody's and S&P's ratings [are] interchangeable and equally reliable indicators of an issue's creditworthiness."

FIRST = Two dummy (1,0) variables to indicate the first issue for an originator or the first use of a type of collateral. It is expected that the coefficient on FIRST will be positive, as the market will be unfamiliar with something about the issue.

CALL = Dummy (1,0) variable with 1 indicating some type of call provision. We expect a positive coefficient.

FREQ = Dummy (1,0) variables signifying interest and/or principal payment frequency. 2, 4, or 12 times are possible in this reduced sample, with 12 the omitted frequency. Signs may go either way; reinvestment risk may be offset by a sort of preferred habitat effect where buyers (mostly institutional) invest in securities with payment frequencies to suit their needs.

BDUM = Dummy (1,0) variable to indicate that the tranche is a subordinate B tranche. The sign is expected to be positive.

MULTA = Dummy (1,0) variable to indicate that the tranche is an A tranche in an issue with multiple A tranches. Because of the possible sequential pay nature of these tranches, they may exhibit different characteristics than a single A tranche.

CSPR = The corporate bond spread between Baa and AAA, a control variable for the time varying price of risk. In the absolute model the absolute spread is used. In the relative spread model it is a relative spread, the spread divided by the AAA rate. This ratio is multiplied by 100 to put it in basis point form like the other independent variables. Figure 3 showed the two move virtually identically.

In addition, interactive variables are formed from cash flow structure dummy variables multiplied by VOL, SLOPE, and IP, in order to investigate the interactions between structure and prepayment and default risk. The indicator variables are for the structures of controlled amortization, bullet, and bond. Pass-through is the omitted group. Later, similar interactive variables will be formed using BDUM and MULTA, interacted with VOL, SLOPE, and IP.

Variations on this initial pricing model, with five subsequent specifications ((2)-(6)), constitute progressively smaller samples available. Variables added to the regression are:

ORIGRT = Dummy (1,0) variables for the senior bond rating of the originator. Originators were divided into five groups: Aaa to Aa3 (omitted), A1 to A3, Baa1 to Baa3, Ba1 to Ba3, and B1 to Caa1.

REP = Reputation of the originator, proxied by the log of the total dollar value of public ABS issues previous to the current issue.[15] Reputation should enter negatively.

ORIGTP = Originator type. Dummy (1,0) variables for the type (bank, thrift, non-bank financial, captive finance company, other). Banks are the omitted group. Originator type may matter to investors if there is some differences in origination standards, clientele, or servicing and monitoring abilities.

INSURE = A vector of 13 credit enhancement variables, as logged percentages of total issue, capturing the various types of enhancement available. These factors should only be significant if investors require additional information on pool quality beyond that contained in the credit rating.

All regressions are repeated using the relative spread instead of the absolute spread. The relative model is identical to the absolute model, with the exception that the interest rate level is dropped for fear of spurious correlation with the dependent variable, and the relative CSPR is used. Results will be discussed where relevant along with the relative spread specification results. The results for the absolute spread regressions are contained in Tables 8-16, and those for the relative spread specification in Appendix C.

[15]Alternatively, a dummy variable is utilized: 1 if the originator had 5 or more previous issue, 0 otherwise.

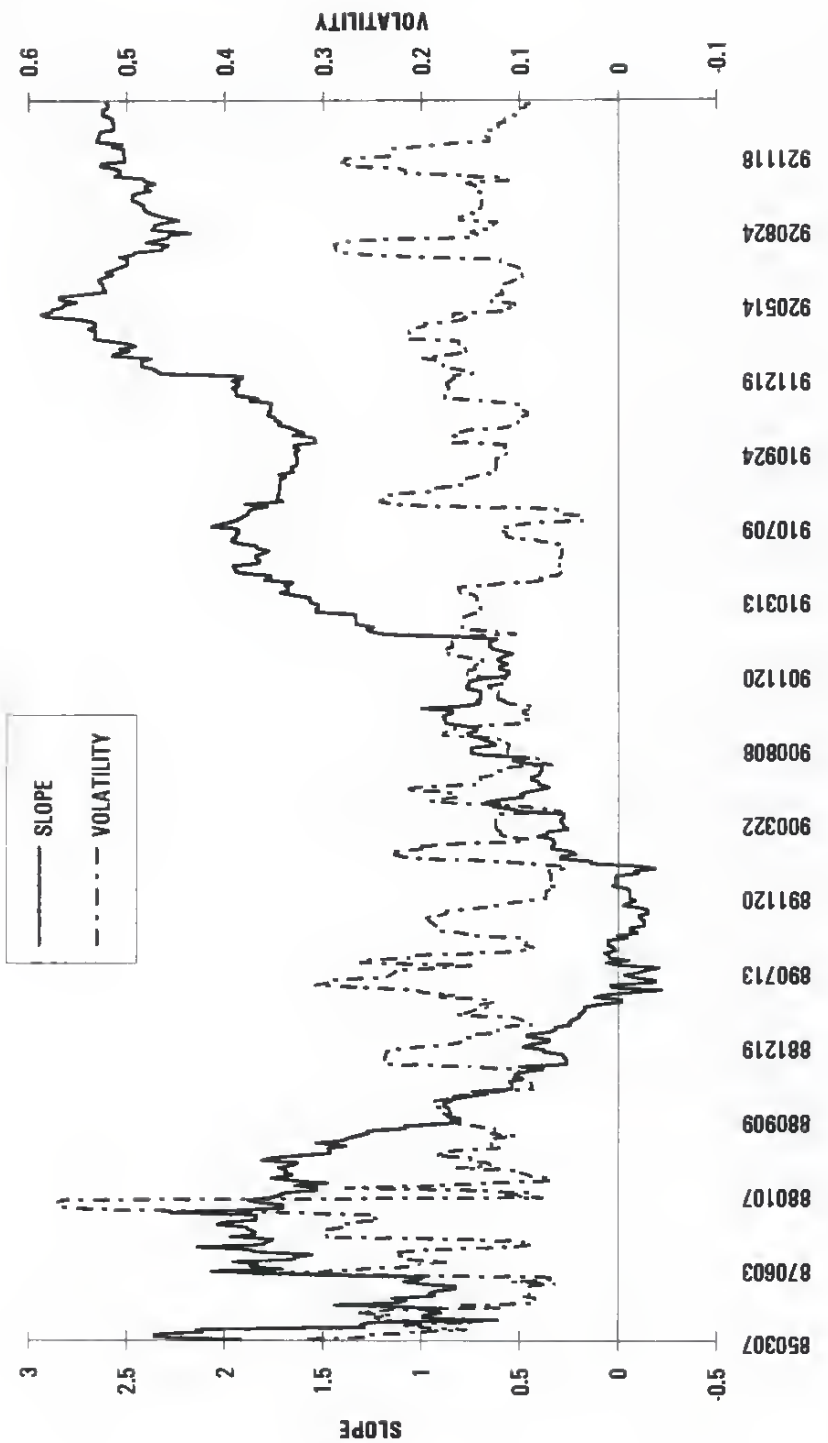

FIGURE 4: YIELD CURVE SLOPE AND TREASURY VOLATILITY 1985-92

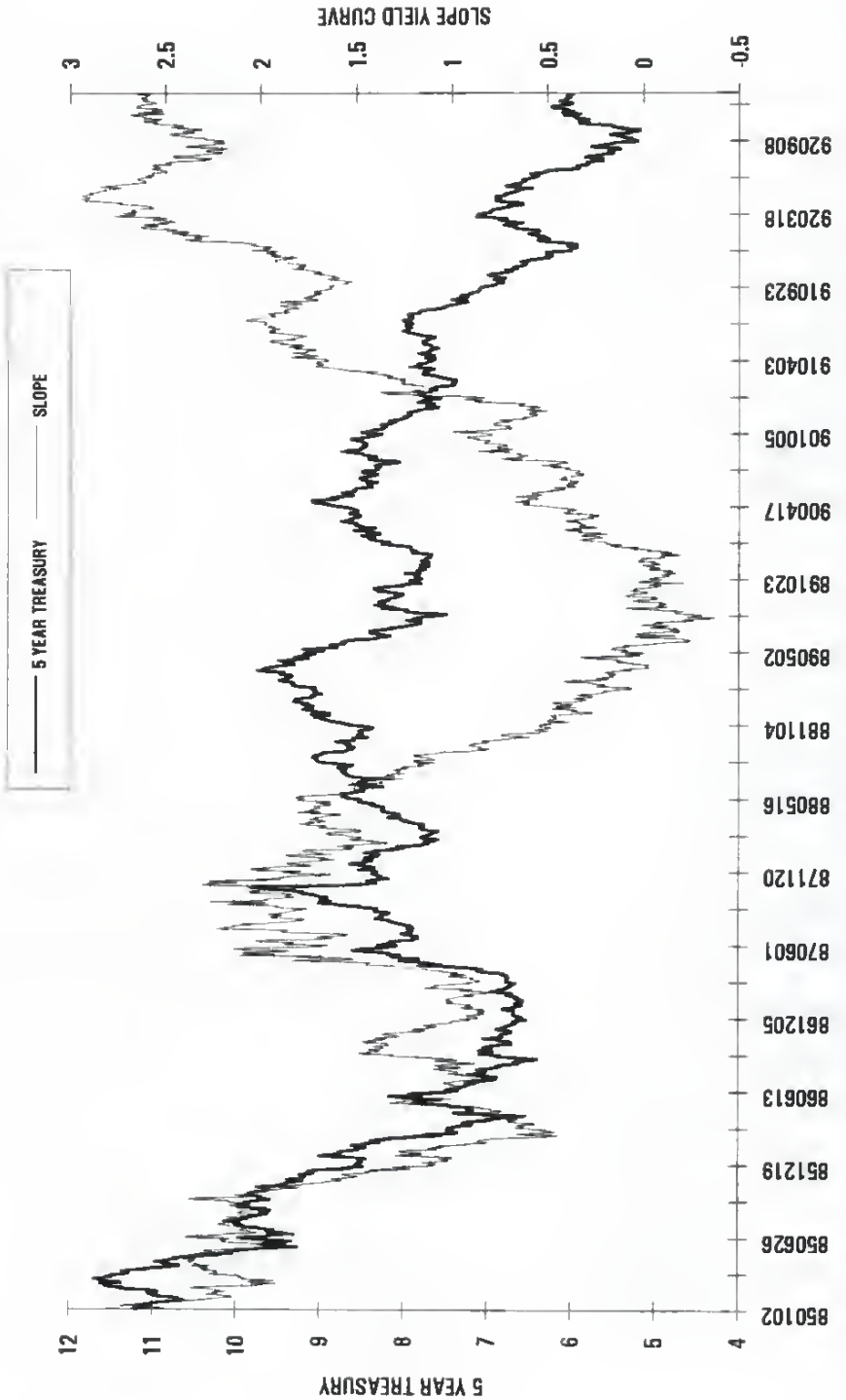

FIGURE 5: 5 YEAR TREASURY AND SLOPE OF YIELD CURVE
(SLOPE = 5 YR TREASURY - 6 MONTH TREASURY)

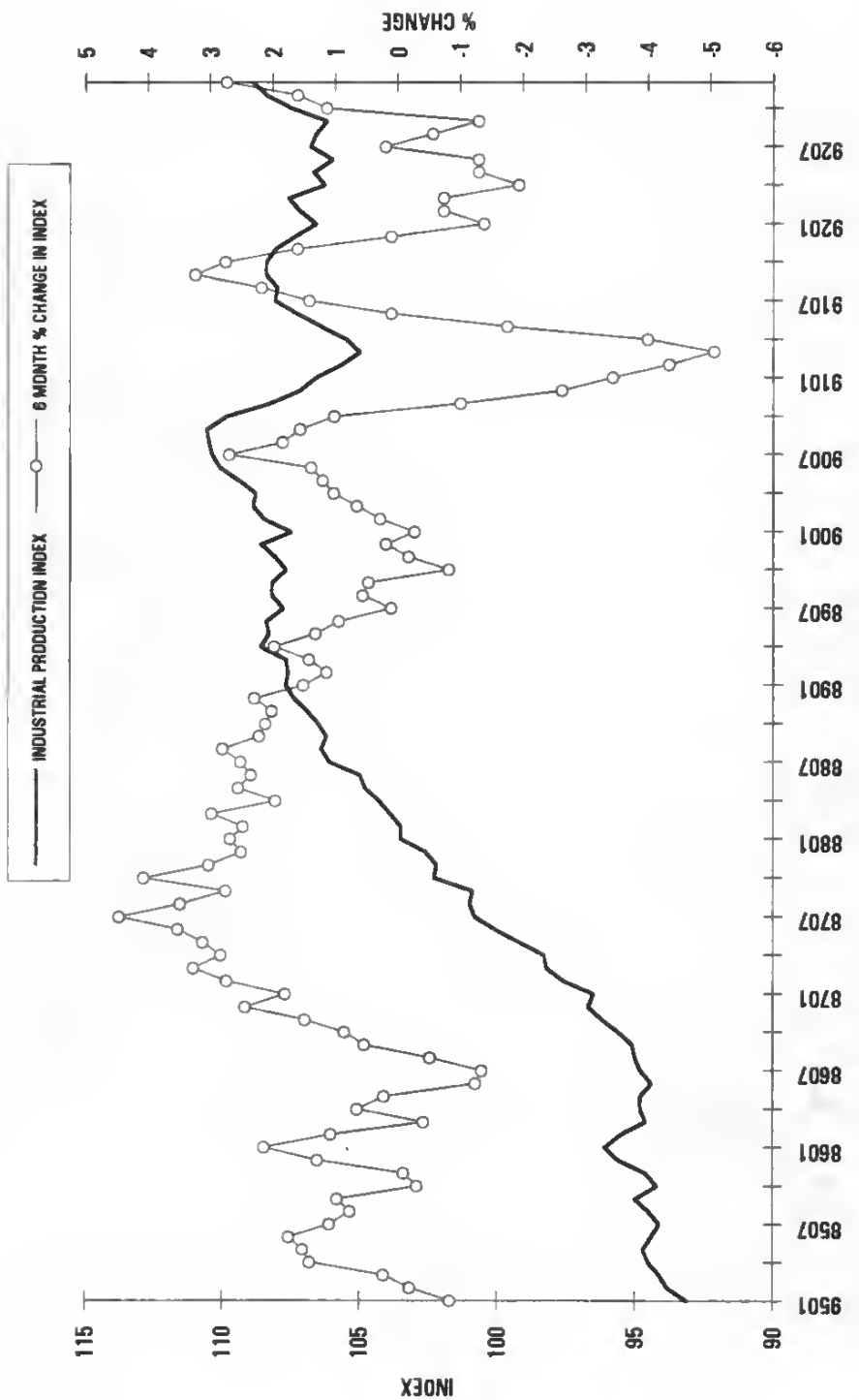

FIGURE 6: INDEX OF INDUSTRIAL PRODUCTION (1987 = 100)

TABLE 3: ABS ISSUES BY YEAR

	ISSUES	TRANCHES	MEAN ISSUE SIZE (MILLIONS)	TOTAL ISSUE AMOUNT (MILLIONS)
YEAR OF ISSUE:				
1985	7	7	$176.70	$1,236.90
1986	16	23	$627.55	$10,040.80
1987	37	51	$277.66	$10,273.44
1988	65	81	$250.03	$16,252.10
1989	68	73	$340.67	$23,165.43
1990	93	119	$460.04	$42,783.45
1991	106	163	$479.58	$50,835.41
1992	111	208	$487.67	$54,131.23
TOTAL	503	725	$414.95	$208,718.76

TABLE 4: SIMPLE FREQUENCIES ABS DATA

	ISSUES	TRANCHES	TRANCHES/ ISSUE
ORIGINATOR TYPE:			
BANKS	190	245	1.29
THRIFTS	55	62	1.13
NON-BANK FINANCIAL	80	164	2.05
CAPTIVE FINANCE CO	149	200	1.34
OTHER	29	54	1.86
TOTAL	503	725	1.44
FIXED RATE		608	
VARIABLE RATE		117	
CALLABLE:			
YES		31	
NO		500	
NA		164	
PAYMENT STRUCTURE:			
PASS-THROUGH		310	
CONTROLLED AMORTIZATION		113	
BULLET		100	
HARD BULLET		88	
SOFT BULLET		12	
REGULAR BOND		7	
PAYMENT FREQUENCY:			
1 X PER YR		1	
2 X PER YR		104	
4 X PER YR		56	
12 X PER YR		474	
NA		80	
TRANCHE TYPE:			
A: NON-SUBORDINATE		608	
B: SUBORDINATE		87	
I: INTEREST ONLY		2	
M: MEZZANINE		5	
P: PREFERRED STOCK		15	
TRANCHE RATING:			
Aaa		549	
Aa1		19	
Aa2		57	
Aa3		6	
A1		20	
A2		47	
A3		4	
Baa1		5	
Baa2		3	
Baa3		2	
B2		1	
NO RATE		12	

TABLE 5: ABS ISSUES BY COLLATERAL 1985-92
(DOLLARS IN MILLIONS)

					% OF TOTAL		% OF TOTAL
	MEAN	MINIMUM	MAXIMUM	TOTAL	$ ISSUED	N	# ISSUES
AUTO/TRUCK LOANS	$454.9	$3.1	$4,000.0	$75,056.4	36.0%	165	32.8%
CREDIT CARD RECV	$614.2	$100.0	$1,886.0	$70,635.8	33.8%	115	22.6%
HOME EQUITY LOANS	$334.8	$71.0	$1,303.2	$24,424.8	11.7%	73	14.5%
CREDIT CARD (RETAIL)	$411.42	$120.0	$961.0	$13,577.0	6.5%	33	8.6%
MANUF HOUS/MOBILE HMS	$159.6	$48.0	$684.6	$7,692.1	3.6%	50	9.9%
DEALER FLOORPLAN LOANS	$550.0	$250.0	$1,000.0	$5,500.0	2.8%	10	2.0%
RV LOANS	$117.6	$74.8	$266.6	$1,533.0	0.7%	13	2.6%
EQUIPMENT LEASES	$470.5	$100.1	$888.4	$1,411.5	0.7%	3	0.6%
AGRICULT. EQUIP	$525.1	$500.1	$550.0	$1,050.1	0.5%	2	0.4%
BOAT LOANS	$196.4	$93.0	$381.0	$881.8	0.5%	5	1.0%
COMPUTER LEASE RECV	$192.3	$145.6	$242.8	$981.4	0.5%	5	1.0%
CONSUMER LOANS (INSTALL)	$435.8	$432.1	$438.5	$871.8	0.4%	2	0.4%
TAX EXEMPT LEASES	$136.4	$20.1	$302.6	$692.2	0.3%	5	1.0%
STUDENT LOANS	$211.1	$103.4	$269.0	$633.4	0.3%	3	0.6%
SMALL BUSINESS LOANS	$522.7	$522.7	$522.7	$522.7	0.3%	1	0.2%
COMMERCIAL MORTGAGES	$202.5	$180.0	$225.0	$405.0	0.2%	2	0.4%
EQUIPMENT NOTES	$132.7	$60.3	$245.2	$388.1	0.2%	3	0.6%
EXIM LOANS	$82.8	$21.8	$138.1	$371.8	0.2%	4	0.8%
AUTO LEASES	$114.7	$63.5	$150.0	$344.2	0.2%	3	0.6%
MISCELLANEOUS	$225.7	$62.5	$513.0	$1,354.0	0.6%	6	1.2%
TOTAL				$206,718.8		503	

TABLE 6: SUMMARY STATISTICS
ENTIRE SAMPLE OF ABS AT OFFER 1985-92

PANEL A: ABS CHARACTERISTICS ALL TRANCHES

	MEAN	MEDIAN	MINIMUM	MAXIMUM	TOTAL	N
ISSUE SIZE (MILL)	$414.9	$285.0	$3.1	$4,000.0	$208,718.5	503
			(FORD CREDIT)	(GMAC)		
TRANCHE SIZE (MILL)	$296.7	$151.7	$0.8	$2,200.0		685
			(ADVANTA)	(FORD CREDIT)		
EXPECTED AVG LIFE (YRS)	3.4	3.0	0.2	20.5		660
EXPECTED YIELD AT OFFER (%)	8.09	8.42	3.75	14.25		565
SPREAD (%)	1.1824	1.0772	-1.4472	5.8941		535
RELATIVE SPREAD	0.1743	0.1585	-0.1818	0.7054		535

PANEL B: A TRANCHE CHARACTERISTICS*

TRANCHE SIZE (MILL)	$337.3	$200.8	$1.7	$2,200.0		585
EXPECTED AVG LIFE (YRS)	3.1	2.85	.2	20.5		588
EXPECTED YIELD AT OFFER (%)	8.14	8.48	3.75	14.25		485
SPREAD (%)	1.1038	1.0357	-1.4472	5.8941		472
RELATIVE SPREAD	0.1838	0.1484	-0.1818	0.7054		472

PANEL C: B TRANCHE CHARACTERISTICS*

TRANCHE SIZE (MILL)	$60.3	$48.58	$2.2	$188.0		94
EXPECTED AVG LIFE (YRS)	5.2	5.0	1.1	13.9		85
EXPECTED YIELD AT OFFER (%)	8.30	8.44	5.08	11.18		58
SPREAD (%)	1.5873	1.4183	0.9924	3.7229		57
RELATIVE SPREAD	0.2475	0.2238	0.1241	0.6227		57

PANEL D: TREASURY RATE CHARACTERISTICS

SLOPE (%)	1.5035	1.7048	-0.2223	2.8396		725
			(89-06-01)	(92-04-23)		
VOLATILITY	0.153	0.1472	0.0353	0.5699		725
			(91-07-22)	(87-11-18)		

INTEREST RATES ARE IN PERCENTAGE TERMS (I.E. 8.5% = 8.5).
SPREAD = EXPECTED YIELD - INTERPOLATED TREASURY OF SAME MATURITY AS EXPECTED AVG LIFE.
RELATIVE SPREAD = SPREAD/INTERPOLATED TREASURY.

* A TRANCHES (PANEL B) AND B TRANCHES (PANEL C) DO NOT INCLUDE INTEREST ONLY OR PREFERRED STOCK. HOWEVER, THESE TWO ARE CONSIDERED TRANCHE TYPES (SEPARATE FROM A, B, AND MEZZANINE) AND ARE INCLUDED IN PANEL A. THIS EXPLAINS THE LOWER EXPECTED YIELD IN PANEL A THAN IN EITHER OF THE OTHER PANELS.

TABLE 7: SUMMARY STATISTICS
FIRST REGRESSION SAMPLE OF ABS AT OFFER 1985-92

PANEL A: ABS CHARACTERISTICS ALL TRANCHES

	MEAN	MEDIAN	MINIMUM	MAXIMUM	TOTAL	N
ISSUE SIZE (MILL)	$433.5	$300.0	$3.1	$4,000.0	$153,444.8	354
TRANCHE SIZE (MILL)	$345.8	$200.6	$3.1	$2,200.0		439
EXPECTED AVG LIFE (YRS)	3.5	3.0	0.5	19.1		452
EXPECTED YIELD AT OFFER (%)	8.22	8.52	3.75	11.20		452
SPREAD (%)	1.1795	1.0887	0.3386	3.7229		452
RELATIVE SPREAD	0.1788	0.1823	0.0451	0.9227		452
TREASURY LEVEL: 5 YR (%)	7.5467	7.7400	5.1900	11.6100		452

PANEL B: A TRANCHE CHARACTERISTICS

TRANCHE SIZE (MILL)	$384.4	$254.1	$3.1	$2,200.0		396
EXPECTED AVG LIFE (YRS)	3.2	3.0	0.5	19.1		397
EXPECTED YIELD AT OFFER (%)	8.20	8.59	3.75	11.20		397
SPREAD (%)	1.1204	1.0489	0.3368	2.7901		397
RELATIVE SPREAD	0.1971	0.1505	0.0451	0.5155		397

PANEL C: B TRANCHE CHARACTERISTICS

TRANCHE SIZE (MILL)	$65.9	$50.0	$9.8	$196.0		49
EXPECTED AVG LIFE (YRS)	5.4	5.0	1.3	13.9		50
EXPECTED YIELD AT OFFER (%)	8.46	8.52	5.30	11.19		50
SPREAD (%)	1.6208	1.4420	0.9924	3.7229		50
RELATIVE SPREAD	0.2459	0.2170	0.1296	0.9227		50

SIMPLE FREQUENCIES ALL TRANCHES

TRANCHES BY YEAR	N
1985	2
1986	11
1987	29
1988	49
1989	52
1990	87
1991	115
1992	107
CASH FLOW STRUCTURE	
PASS-THROUGH	258
CONTROLLED AMORTIZATION	97
BULLET	92
BOND	5
TRANCHES BY ORIGINATOR TYPE	
BANK	187
THRIFT	39
OTHER FINL INST	82
CAPTIVE FINANCE CO	147
NONFINANCIAL	18

COLLATERAL	N
CREDIT CARDS	122
CREDIT CARD RETAIL	33
AUTO/TRUCK	139
HOME EQUITY	65
MOBILE HOMES	58
COMMERCIAL MISC.	16
CONSUMER MISC.	16
TRANCHE RATING	
Aaa	364
Aa1/Aa2	42
Aa3/A1	13
A2	27
A3 and lower	9
SUBORDINATION LEVEL	
A	397
MEZZANINE	5
B	50
MULTIPLE A TRANCHES	96

INTEREST RATES ARE IN PERCENTAGE TERMS (I.E. 9.5% = 8.5).
SPREAD = EXPECTED YIELD - INTERPOLATED TREASURY OF SAME MATURITY AS EXPECTED AVG LIFE.
RELATIVE SPREAD = SPREAD/INTERPOLATED TREASURY.

CHAPTER 6
REGRESSION RESULTS

The Basic Absolute Spread Model

The initial base regression results (Model 1, Chapter 5) for the absolute spread model are reported in Table 8. Because of indications of heteroscedasticity, all t statistics are based on White's consistent covariance matrix.[1] Overall, the model performs relatively well. The adjusted R square is just over 0.66, indicating that the model explains a significant proportion of the relative spread over the sample period.[2]

Default Risk: The Insurer's Option

Tranche rating is primarily based on the credit and guaranty of the insurer. Because the insurer possesses the option to default, investors are exposed to default risk. Tranche ratings are significant, of the expected sign, and the coefficients are generally

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[1]Collinearity tests were also run on this specification. Both collinearity tests available on SAS were run, the COLLIN and COLLINOINT (no intercept, centers the variables) options to the REG procedure, based on the recommendation of, respectively, Judge, et. al. (1985) and Freund and Littell (1991). These tests are based on the work of Belsley, Kuh, and Welsch (1980). There only high condition number (the square root of the ratio of the highest to the lowest eigenvalues) in the COLLINOINT option is 30.5, just above 30, the condition number that is generally believed to indicate a potentially serious multicollinearity problem. The variance proportions suggest that the bond interactives for slope and VOL are involved. Collinearity resulting from the use of dummy variables is common (see Freund and Littell, 1991). The COLLIN option indicates some potential collinearity between the intercept and the level of interest rates. This collinearity should not affect the other coefficients.

[2]This adjusted R Square compares similarly with those in bond issue studies, such as Allen, Lamy, and Thompson (1987, 0.6446), Kidwell, Marr, and Thompson (1984, 0.794), and Lamy and Thompson (1988, 0.4415). Mortgage-backed studies generally have higher adjusted R Squares, e.g., Milonas (1987, 0.9) and Rothberg, Nothaft, and Gabriel (1989, 0.82).

increasing as rating decreases. This parallels the increasing value of the put option possessed by the insurer as rating decreases. The high t statistics and the relatively high coefficients indicate that rating is a very important pricing consideration. Notice that the control variable, CSPR, for the time varying price of risk is highly significant (t = 7.45) and of the proper positive sign. The sufficiency of the credit rating to ABS investors will be explored in later discussion.

The Borrowers' Options

The borrowers of the underlying loans possess the options to prepay and default. These options expose the investor to interest rate and reinvestment risk. While there are indications of some concern with prepayment by investors, clearly prepayment is a minor concern vis-à-vis the level of prepayment concern with an MBS.

The borrowers' option to prepay, which exposes the investor to interest rate and reinvestment rate risk, is proxied by the slope of the yield curve (SLOPE) and interest rate volatility (VOL). In addition, the value of this option should increase with expected life (LIFE).

Earlier discussion has emphasized the importance of the slope of the yield curve in determining the importance of the prepayment call option to an ABS. That is, do ABSs exhibit negative or positive convexity, and thus behave more like a mortgage-backed security or a non-callable corporate bond? The coefficient on the slope of the yield curve is insignificant and negative for the pass-through securities. In mortgage-backed studies, the slope is always negative and significant. The results here suggest that prepayment risk is not a dominant concern for ABS investors. However, the slope

coefficient is not positive, as Dunn and McConnell (1981) would suggest for a non-callable, amortizing security.

The interactive variables illuminate the relationship among the structural types. The coefficients for total effects by cash flow structure of SLOPE are presented below. The total effects are obtained by adding the coefficient on SLOPE with the coefficient on the interactive. For example, the coefficient for the total effect of SLOPE on a bullet structure is found by adding the coefficient on SLOPE with that on Bullet*SLOPE: -0.0178 - 0.0240 = -0.0418 (the slight difference from the numbers below is due to rounding in the tables presented). F tests that the total effect equals zero are also presented and the total BULLET-SLOPE effect is not significantly different from 0. (The actual coefficient on Bullet•SLOPE in the regressions is the difference between the effect of SLOPE on a pass-through structure and the effect of SLOPE on a bullet structure.)

Slope	Total Effect	F	Prob>F
Pass-through	-0.017751	0.57	0.4500
Controlled Amort	-0.098678	10.19	0.0015
Bullet	-0.041739	1.76	0.1847
Bond	-0.094357	0.02	0.8819

As predicted if prepayment is not the dominant concern, the slope coefficients on cash flow structure are more negative as the cash flow structure becomes less amortizing. With controlled amortization, principal is paid out in a limited amortization period late in the issue's life; with bullets and bonds, principal is paid out at or nearly at the end of the issue life. The coefficient on controlled amortization is significant. This result is most probably due to reinvestment risk of the expected cash flows (as suggested in the trade press), not prepayment (i.e., unexpected cash flows) since these non-pass-through

structures are somewhat protected from prepayment risk. Recall, if reinvestment risk of the expected cash flows is of concern, pass-through securities are said to "roll down" the yield curve slower than a controlled amortization structure or a bullet, and vice versa. That is, pass-through is preferred in a flat yield curve environment, bullet or controlled amortization are preferred in a steep, positive yield curve environment. For the controlled amortization or the bullet, as the slope increases, they are preferred, and a lower yield is required. The negative coefficient results. Thus, these different cash flow structures are not perfect substitutes and require a yield differential in different term structure environments. This result implies that prepayment risk is not a dominant concern for ABS investors. If it were, we would expect the coefficient on pass-through to be negative and significant and we would expect the total effects on the more protected cash flow structures to be less negative.

The interest rate volatility effect is significant and positive for both the pass-through and controlled amortization structures. The total effects are:

Volatility	Total Effect	F	Prob>F
Pass-through	+0.788249	13.14	0.0003
Controlled Amort	+0.46012	2.81	0.0941
Bullet	-0.031137	0.01	0.9124
Bond	+0.088007	0.03	0.8667

As expected if prepayment is being proxied by this variable, the effect on controlled amortization is smaller than the effect on a pass-through.[3] The effect on the bullet

[3]This is what Brennan and Schwartz's (1985) two state variable model would predict, not Dunn and McConnell's (1985) one state variable model. This could indicate that the two state variable model does more accurately price callable, amortizing securities.

structure cannot be distinguished from zero. The bullet structure, in comparison to the pass-through and controlled amortization, is preferred in a highly volatile interest-rate environment. If interest rate volatility is a valid proxy for prepayment risk, this would indicate that the bullet structure is a successful structure to limit exposure to prepayment risk and that prepayment risk is a concern to ABS investors. But all interest sensitive securities are sensitive to interest rate volatility. Dunn and McConnell suggest that amortizing (non-callable) securities are less sensitive to interest rate volatility than non-amortizing securities. This is not what we find here, suggesting that prepayment risk is of some concern to investors.

The borrowers' option to default, which exposes the investor to prepayments and thus reinvestment (and possibly interest rate) risk, is proxied by the percentage change in the Industrial Production Index (IP). In addition, the value of this option should increase with expected life (LIFE). The total effects of IP by cash flow structure are as follows:

IP	Total Effect	F	Prob>F
Pass-through	-0.019823	6.97	0.0086
Controlled Amort	-0.017956	2.00	0.1573
Bullet	-0.012772	0.54	0.4634
Bond	+0.097136	0.06	0.7974

The effect of the six month change in industrial production on the pass-through structure is significant and negative. The effect on controlled amortization and bullet appear similar to that on pass-through, but neither total effect can be distinguished from zero. If the change in industrial production is a proxy for default prepayment risk, this result would indicate that as the economy worsens, investors feel that the probability of defaults

in the future has increased and thus the probability of borrower default induced prepayments. A premium is required, at least for pass-through structures, because investors may feel that the poor economy that would induce such prepayments will afford fewer reinvestment opportunities. It makes sense that pass-throughs would be the most affected cash flow structure, because prepayments are passed on immediately in that structure. This story intuitively makes sense. However, it is very difficult to claim that this countercyclical result can be attributed solely or even significantly to default prepayment concerns. It is consistent with such a concept, but it could also be due to lower relative demand for ABSs versus Treasuries in a down economy which would lower prices and raise yields. The negative coefficient clearly shows that the pricing of ABSs is countercyclical.

The coefficient on expected life is positive and significant. Although calculating the spread from a comparable maturity Treasury should produce a measure adjusted for a maturity premium in the term structure, default prepayment risk and prepayment risk would be expected to increase with time to maturity.[4] In addition, the expected average life of an ABS is an inexact figure, depending on delinquency rates, prepayment rates, and so on. These would be expected to be less accurate the longer the expected life of the tranche, thus increasing the risk that realized results will differ from expected.

The final option component is the callability of the issue (CALL). The callability variable is insignificant but the sign is of concern; it is unexpectedly negative. A

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[4]Kidwell, Marr, and Thompson, 1984, in their examination of shelf registration of bonds, also find the coefficient on log maturity significant and positive. It is also possible that this significant coefficient is the result of using expected average life and Treasury maturity rather than duration. However, a duration measure is not available on these ABSs.

callable security contains a valuable option for the issuer; it should result in a higher required yield. The callable securities were further investigated by retrieving the original Asset Sales Report or Wall Street Journal article on the issue, where available. Although in the Warga dataset these calls were not categorized as "clean-up" calls (a separate category), clearly some of these are. For example, the call on a Beneficial Mortgage Co. tranche from September of 1991 is really a B tranche tail protection, an accelerated defeasance structure designed to limit the tail on a B payout stream. Clean-up calls, which occur only when principal remaining is quite low, are not negatively perceived. In addition, even if these calls were not clean up calls, it is likely that there is less incentive to call with an ABS than with a corporate bond. These securities are generally of a shorter maturity and are backed by a fixed set of assets. And even when not, as with credit card receivables, the interest rates on the receivables are quite sticky. If the income on the assets is fixed, and the life of the security is relatively short, the incentive to call is diminished. Finally, with an ABS the holders of the securities often are basically an equity class. All of these factors make the performance of the call variable less surprising.

Marketability and Related Issues

The marketability of these issues might be expected to be influenced by the size of the issue (SIZE), the introduction of a new collateral type (First Collateral) or originator (First Issue), and possibly by payment frequency (FREQ). In addition, the time trend by quarter (TIME) may pick up a change in the liquidity, risk assessment, or market composition of these issues over time.

Issue size has an unexpected positive sign, although it is insignificant. Issue size is usually, although not always, significant and negative in bond pricing studies; ABS issue size seems less important in pricing than other factors. A positive relation with spread may be due to the difficulties in marketing a large issue in a smaller market (compared to the bond market) such as the ABS market. The results do not change when tranche size is used instead (this necessitates a slightly smaller sample).

First issue by an originator is significant and positive at the 10% level, implying that the market does require a premium for inexperience or unfamiliarity. First collateral is insignificant and negative. At first reading, the negative sign may be surprising. But it is consistent with the findings of Tufano (1989) who studied the gains to the financial innovator, or "first mover." He found that innovators do not charge higher prices during their monopoly period; in fact they tend to underprice. The gains to the innovator come via increased volume of business over time. Thus, the results offer some limited evidence that the market does price experience.

While frequency of payment four times a year is insignificant, payments two times a year is significantly negative. The typical ABS pays out monthly. The negative coefficient probably reflects a clientele effect for this atypical payment pattern.

The time trend is significantly positive. This result is consistent with a market broadening trend over time dominating any market deepening trend. This is not surprising given that an extensive private market for ABSs existed before and exists contemporaneously with the public market. The maturing process for the public market

would have been aided by the private market.[5] That is, the initial understanding of and marketability of these securities would have been aided by the existence of the private market. A protracted market deepening process may not have been necessary. On the other hand, the growth of the ABS market has been very rapid, as Figure 1 showed. Thus, it appears that the market may have expanded rapidly with lessor known originators and less understood structures, and higher yields resulted.[6]

Further Investigation of the Time Trend

But note that this time trend is also consistent with an initial underestimation of ABS risks. As these underestimated risks became better understood, yield spreads would likely increase. Also, a change in market and/or sample composition could result in a positive time trend. For example, the sample may simply have moved toward riskier issues. Thus, the time trend could be an artifact of the sample and/or the market. Tables

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[5]"Nonmortgage-backed finance is more complex [than mortgage-backed finance]. Legal, regulatory, and accounting uncertainties remain, and no single industry is dedicated to providing outside equity. Consequently, the private placement market, which more easily accommodates such uncertainties, has emerged more quickly than the public securities market" (Standard & Poor's, 1988, p. 61).

[6]The rapid growth in dollars of securities issued suggests marketability proxies based on dollars issued would be valuable. Two such proxies were used--the total dollars issued in the market (logged) prior to issue day and the total dollars issued for the previous three months (the market saturation or "hotness" proxy). Both of these variables are highly trended with time (correlations with the quarter time trend are 0.9 and 0.8, for total issue dollars and previous quarter's issue dollars, respectively). When entered separately, both perform quite similarly to the time trend--they are positive and slightly less significant than the quarter trend. Separately, they are dominated by the quarter trend, although obviously highly collinear. The quarter time trend is shown because it is simple and straightforward. Splitting the time trend at various quarters did not indicate any significant change in the trend.

9 and 10 breaks down the type of issues over time in two ways. Table 9 presents collateral type by year in the sample. Table 10 does a similar breakdown by structure.[7]

Both tables indicate that composition is not constant over time. As was fully expected because of the growth of the market, the early years carry less weight than the later years. While collateral types such as auto/truck loans and even mobile home loans are fairly well distributed over time, credit cards do not enter till 1987, retail credit cards till 1988, and home equity till 1989. Credit cards have a significant impact from 1989 on, although in 1992 auto/truck dominates once again. The overall picture is of a market whose composition is changing over time, both in breadth and in dominant collateral type.

Composition by structure partially mirrors this picture. Pass-through doesn't enter the sample till 1987, but then it quickly becomes extremely dominant. In 1991 and 1992, pass-through represents over one-half of each year's issues. Bonds, on the other hand, are only present in 1987 and 1988. Thus, structure by year presents a more specific movement--into pass-throughs.

Clearly there is evidence of a change in composition. Thus, additional regressions were run in order to better characterize the trend over time. First, dummy variables for each of the five largest originators (Citicorp, GM, Chrysler, Sears, and Household Finance) were interacted with the time trend. What results is a time trend for all other originators and the incremental time trend effects for each of the five major originators. The total effects, including F tests that the total effect equals zero, are:

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[7]Both tables use tranche dollar values, a variable not always present in the data set. Therefore the dollar totals will not necessarily match exactly with annual issue dollars.

Originator	Time Trend Total Effect	F	Prob>F
All Others	0.014410	17.11	0.0001
Citicorp	0.014773	10.91	0.0010
GM	0.005926	1.63	0.2016
Chrysler	0.011776	7.96	0.0050
Sears	0.014437	13.76	0.0002
Household Fin.	0.016168	13.99	0.0002

The time trend (0.14410) is virtually the same as the trend in Table 8. Moreover, all of the total effects of the major originators are positive; all but GM are significantly different from zero. Thus, except for GM, the evidence is that spreads widened over time even for individual issuers. However, there is still the possibility that the issues by these originators changed in composition in some manner to create a positive time trend

Second, separate regressions were run on homogeneous groupings to see if there is evidence of a trend for similar types of securities. There is a significant loss in power of the tests because sample size is greatly reduced. Three homogeneous groups were identified. Triple A rated, auto loan backed, pass-through securities; triple A rated, credit card receivable backed, controlled amortization securities; and triple A rated, home equity backed, pass-through securities. The time trend coefficients and T-statistic are as follows:

Security Type	Time Trend Coefficient	T-Stat	N
AAA, Auto, Pass-Through	0.011081	1.287	97
AAA, Credit Card, Controlled Amortization	0.004796	0.691	54
AAA, Home Equity, Pass-Through	0.253034	3.041	56

The time trend for all of the three groups are positive, but only the time trend for home equity is significant. The coefficient for Auto is just a bit less than the overall coefficient from Table 8 (0.0144). Credit card, controlled amortization is much less than the overall coefficient. However, the coefficient for home equity (0.25) is very large in comparison to the others above and to the overall coefficient. Recall from Table 9 that home equity collateral was not introduced into the sample till 1989.

Thus, these results would indicate that the widening of spreads over time may be at least partially due to the introduction of home-equity-backed issues in 1989 and the subsequent widening of spreads of that type of issue. Home equity issues are expected to be more sensitive to borrower prepayment than other types of issues and thus more sensitive to interest rate drops. Figure 5 showed interest rates dropping over this period. However, the home equity trend does not drive the overall time trend. When the sample is run without home equity, the time trend is still positive (coefficient = 0.01257) and significant (T-stat = 3.35675).

But while market recomposition and a particular type of ABS (i.e., home equity) may be influencing the time trend, the results also show that there has <u>not</u> been any narrowing of spreads over time, for particular types of issues or tranches, for particular originators, or for the market in general. Thus the conventional market wisdom, that ABSs initially offered an unusually high premium just for its newness, a premium which diminished over time, is not supported by the data.

The Influence of Collateral

Collateral type shows some significance. Specifically, home equity, mobile homes, and the miscellaneous retail category carry significantly higher spreads than the omitted category, credit card receivables. The earlier discussion in Chapter 4 implied that there might be a number of reasons that investors may distinguish among collateral type--difference in underwriting standards and servicing quality across collateral type, differences in competition or event risk that might affect future cash flows, and the distinction between collateral backed by real assets and collateral that is not. Thus, it was implied that collateral might capture unknown, omitted risks or distinctions.

For the two specific types of collateral showing significance, it may be possible to ascertain why the collateral dummy variable is significant. In the previous discussion of the time trend, it was seen that home equity issues showed a significant positive time trend most probably because home equity loans are more sensitive to prepayment risk (and thus interest rate changes) than most of the other collateral types. If that is true, then interacting the home equity dummy variable with the proxies for prepayment risk might reduce the significance of the home equity dummy.

In fact, this is the case. In a separate regression, not shown, the home equity collateral dummy was interacted with SLOPE and VOL, the two prepayment risk proxies. The home equity dummy variable loses significance (T-stat = 1.17). Neither of the interactive proxies are significant (T-stat = 1.27 for the VOL interactive, 1.22 for the SLOPE interactive); however, an F test does reject the hypothesis that both coefficients equal zero ($F = 3.75$, $Prob > F = 0.0244$). These coefficients represent the difference

between the effect on home equity pass-throughs and the effect on other pass-throughs. Thus, it appears that the collateral dummy variable for home equity is capturing the increased sensitivity of home equity to prepayment risk.[8] In a subsequent section of the analysis, home equity will be shown in a separate regression precisely to examine these differences.

The manufacturing/mobile home collateral story is not so simple. As with home equity, we might expect that borrowers of the underlying loans may be more likely to prepay than most other ABS borrowers. But it is also common knowledge and commonly reported in the trade press that ABSs with such collateral require enormous amounts of credit enhancement. Thus there may be two distinctions (at least) that the collateral dummy is capturing. The results bear this theory out. When the mobile home dummy is interacted with the prepayment proxies, the interactives are significant (T-stat = 2.4 for the VOL interactive, 2.28 for the SLOPE interactive[9]). However, the home equity collateral dummy still retains its significance. Thus, it appears that this collateral variable is capturing other risks as well. We will return to this subject in the credit enhancement regressions and discussions.

Thus, it appears that the collateral dummy variables do capture distinctions between securities not explained by the other variables. In the cases we were able to explore, sensitivity to prepayment risk is part of the story, but it is not the complete story.

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[8]Similar results were found when the home equity dummy was also interacted with IP, the proxy for (borrower) default prepayment risk. The interactive IP variable has virtually no significance (T-stat = 0.215).

[9]When the collateral dummy is interacted with the default prepayment proxy IP the interactive is also significant.

Summary of Absolute Spread Results

This first regression provides support that the model is performing adequately. Issue rating is clearly an important factor in pricing. Pricing exhibits some evidence of prepayment risk, but clearly not at the level of mortgage-backed securities. The market does distinguish between cash flow structures: in a steep, positive yield curve environment, the more certain cash flow structures are preferred and require lower yields; in a highly volatile interest rate environment, the pass-through structure requires a premium. Default prepayment risk might be a factor--the results are consistent with this--but it is likely that the yield spread is countercyclical.

Inexperience, at least the inexperience of a new originator, does require a premium by the market. A positive time trend probably reflects market recomposition over time, but it appears that there has been no narrowing of spreads over time, either for major originators or homogeneous ABS securities. There is evidence that collateral does matter to pricing. The collateral distinction is probably proxying for other distinctions, but those distinctions are not the same for each collateral type. For home equity collateral, the collateral dummy proxies for an increased sensitivity to the borrower options. For mobile home collateral, such an increased sensitivity is insufficient to explain the significance of the dummy variable.

Finally, the dummy variable for a B tranche is significant and positive, implying that B tranches require a higher yield. The multiple A tranche dummy is insignificant, implying that simply splitting up cash flows into sequential tranches does not lower

required yield. Both of these tranche types will be explored in more detail in the next section.

The Relative Spread Model

The results from the relative spread model (Table 17 in Appendix C) are not identical to the absolute spread model, although they are roughly comparable. Issue credit rating are still very important to pricing, and collateral seems to offer additional information. However, two categories, mobile homes and miscellaneous retail are no longer significant. Credit card retail and auto have flipped signs, although they are still insignificant. Slope is now significantly positive for pass-throughs, and two structures--controlled amortization and bullet--are significantly different. If accepted, these results would offer more evidence of the relative unimportance of prepayment risk to ABSs. The dummy for a first issue by an originator is now insignificant, as are the payment frequency variables.

The question of which model to accept may come down to the stability of each specification over varying interest rate levels. Cook and Hendershott (1978) argue that absolute spreads move linearly with interest rate level and result in the more stable specification. Lamy and Thompson (1988) offer evidence that for corporate bonds the relative spread is the more stable specification. The interest rate level is insignificant for absolute spreads. The relative spread model was tested with interest rate added to the specification. The rate variable was highly significant and negative. While there is the chance that the significance was a result of spurious correlation, since the dependent variable is deflated by a Treasury rate, the conflicting results with the absolute spread

model suggest that for ABSs the relative spread specification may be less stable over varying interest rate levels. Thus, the absolute spread model is emphasized in this study.

Interactive Variables for B Tranches and Multiple A Tranches

Table 11 shows the results of the regression where interactive variables have been added for the B tranches. The model is:

$$\begin{aligned} SPREAD_i = {} & \alpha_0 + \alpha_1 I_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i + \alpha_7 IP_i \\ & + \alpha_8 RATE_i + \alpha_9 COLLAT_i + \alpha_{10} FIRST_i + \alpha_{11} CALL_i + \alpha_{12} FREQ_i + \alpha_{13} CSPR_i \\ & + \alpha_{14} INTERACTIVES_i + \alpha_{15} BDUM_i + \alpha_{16} B\text{-}INTERACTIVES_i \end{aligned} \quad (2)$$

The five mezzanine tranches have been omitted, so as not to confuse the contrast between senior and subordinate tranches. Mezzanine tranches are credit enhancement tranches subordinate to A tranches but senior to B. The rest of the model is generally unaffected, but the B tranche interactive variables do enter with much significance. Note that there are no B bonds.

The total effects of VOL, SLOPE, and IP on the B cash flow structures are presented below. The results indicate that the subordinate tranches do face significant prepayment risk. This would be expected, as it is a B tranche, last in seniority, that would have the greatest effect on its cash flows from prepayment. The coefficient on the pass-through interactive slope variable (B•SLOPE) is significant and negative. This indicates a concern with prepayment not evidenced in an A pass-through. The bullet B, however, is significantly positive, implying that this more fixed cash flow structure is effective in alleviating prepayment concerns. Controlled amortization is not as effective as the bullet structure with alleviating prepayment risk, but it is less sensitive than the pass-through, as expected. Its coefficient cannot be distinguished from zero.

Total Interactive Effects on B Tranches

Volatility	Total Effect	F	Prob>F
Pass-through	+4.701647	20.96	0.0001
Controlled Amort	-2.591222	2.45	0.1181
Bullet	-2.982313	5.40	0.0206
Slope			
Pass-through	-0.201871	7.43	0.0067
Controlled Amort	+0.010667	0.01	0.9268
Bullet	+0.230201	6.87	0.0091
IP			
Pass-through	-0.085849	16.54	0.0001
Controlled Amort	+0.107496	3.61	0.0582
Bullet	-0.030161	0.21	0.6411

B tranches are significantly more sensitive to interest rate volatility, consistent with a concern with prepayment risk. The effects, in fact, are enormous and in two cases, pass-through and bullet, highly significant. Interest rate volatility seems tremendously important to pricing a B tranche. Controlled amortization and especially the bullet structure are highly preferred in a volatile environment. These structures are effective in allaying investors' concerns.

B pass-through tranches react even more negatively than A tranches to a change in economic conditions, indicated by the significant negative coefficient on B•IP. The controlled amortization, however, seems to be pro-cyclical, probably indicating that when economic conditions are worsening, a controlled amortization structure is preferred to a pass-through structure. The results of Model 2 indicate that B tranches are more sensitive to prepayment and default prepayment risk, an intuitively correct result. The more

structured tranches, cash amortization and bullet, are valued considerably by investors in highly volatile or economically depressed environments.

In results not shown, similar interactives were formed for A tranches that are from an issue with multiple A tranches. The intuition is that because of the sequential nature of these securities, they might behave differently than other A tranches. All interactives enter insignificantly, echoing the results with a simple Multiple A tranche dummy in Table 8. The reason is probably quite simple: we would expect differences between tranches first in sequence to receive cash flows and last, much like we see between A and B tranches. However, when all sequential tranches are grouped together, the differences offset one another. Only a regression that could separate by seniority would capture this effect. This is not as simple as it sounds, because the tranches vary by cash flow structure as well as simple timing.

The results for the relative spread model are comparable, although the B interactive variables show a bit less significance. The results are shown for illustrative purposes in Table 18, Appendix C.

Reputation and Originator Rating

The importance of originator characteristics is analyzed by adding a reputation variable and originator rate dummy variables to the model. Results are in Table 12. The specification used to analyze reputation is:

$$SPREAD_i = \alpha_0 + \alpha_1 1_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i + \alpha_7 IP_i + \alpha_8 RATE_i + \alpha_9 COLLAT_i + \alpha_{10} CSPR_i + \alpha_{11} INTERACTIVES_i + \alpha_{12} BDUM_i + \alpha_{13} B\text{-}INTERACTIVES_i + \alpha_{14} REP_i \quad (3)$$

The reputation variable employed in the regression shown is the logged dollar value of all issues by the originator prior to a particular issue. This proxy for reputation is of the expected negative sign and significant. However, such a proxy obviously includes a significant size effect; large firms with large issues will have a larger effect. To study if the effect holds with a possibly less size-sensitive proxy, the regression was run with an alternate proxy, a dummy variable with one indicating five or more previous issues, zero otherwise. This is a variant on the first issue variable, which was significant in the absolute spread specification. This variable is also of the expected negative sign and also significant at the 5% level (coefficient = -0.0644, T stat = 2.388). Again, the evidence from the absolute spread specification is that experience does matter to pricing in the ABS market.

The results of adding originator rating to the specification are presented in the right half of Table 12. The originator would be expected to matter if the legal structure of the issue is not perceived to be truly "bankruptcy remote" or if the condition of the originator, which is also often the servicer, is a concern to investors because of possible effects on cash flow and pool condition. If the legal structure of an ABS performs as intended, the SPV that issues the security is truly separated from the originator who sells the assets. Investors have no recourse to the originator in case of default problems.[10]

[10]Investors will, of course, have recourse in the case of fraud (by the originator).

If the market truly perceives this to be so, then the rating of the originator should have no effect on the pricing of the securities.

But the legal separation of the originator and issuer could hold and the originator still matter to pricing because bankruptcy of an originator might trigger an early amortization event and because the originator's financial condition is important to receivable collateral value, borrower behavior, and credit quality. A bankruptcy by the servicer could result in an interruption in the transaction management duties and possible cash flow effects for investors and could result in a lowering of pool quality. If the tranche ratings do not assess all these risks, then the originator's condition would be relevant to pricing.

The specification is:

$$\begin{aligned} SPREAD_i = {} & \alpha_0 + \alpha_1 I_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i \\ & + \alpha_7 IP_i + \alpha_8 RATE_i + \alpha_9 COLLAT_i + \alpha_{10} CSPR_i + \alpha_{11} INTERACTIVES_i \\ & + \alpha_{12} BDUM_i + \alpha_{13} B\text{-}INTERACTIVES_i + \alpha_{14} ORIGRT_i \end{aligned} \quad (4)$$

The sample size has been reduced because ratings could not be found for all originators. There are no bonds in the sample. Three of the four originator rating categories are significant and all are of the expected sign. This is strong evidence that the market does include an assessment of the originator in pricing. If it was only the question of legal separation, we might not expect three of the four rating categories to be significant. That is because only the lowest rated firms would be expected to fail with anywhere near a significant probability. The fact that most ratings matter indicates, rather, that the market

infers information about present and future pool quality from the condition of the originator. This information is used in addition to the credit rating of the tranche.[11]

Once again, the relative spread model gives conflicting results (Table 19). Neither reputation or originator rating is priced. The signs on the reputation variable is the expected sign; however, two of the four originator rating coefficients are negative, a non-intuitive result.

"Are Banks Different?"

The sample was divided up into the three major collateral types in order to better address the question as to whether the institutional form of the originator adds any information to the pricing model. The isolating of collateral not only allows conclusions about why institutional form may be important, it also allows us to assess the degree to which different collateral types face similar risks. The reduced samples necessitated restricted models. That is, in these groupings, all the low ratings are B tranches. Thus the B effects are captured completely by rating. Regressions were run with and without the B tranches. The results are virtually identical. The results without the B tranches are shown. The model is:

[11]This result is supported by a comment by an Executive Managing Director of S&P that there are "modest pricing distinctions relevant to underlying issuer credit quality" (Griep, 1993, p. 144).

$$SPREAD_i = \alpha_0 + \alpha_1 I_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i + \alpha_7 IP_i + \alpha_8 RATE_i + \alpha_9 CSPR_i + \alpha_{10} INTERACTIVES_i + \alpha_{11} ORIGTP_i \quad (5)$$

The results are shown in Table 13. The originator type dummies generally enter with significance in all three panels--credit card receivables, auto/truck loans, and home equity loans.

In the credit card panel, two of the institutional forms, savings and loans and captive finance companies, enter significantly. Banks, the omitted group, have significantly tighter spreads. This lends some support to the notion that bank loans (in this case credit lines) are somehow different from non-bank loans--either because of stricter credit standards, greater information about their borrowers because of other long-term relationships, more effective monitoring, or even borrower self-selection. And this information is valued by the market even after accounting for issue rating and payment structure.

However, in the auto market the evidence is a bit different. Captive finance companies enter negatively and significantly, while finance companies exhibit a positive, significant coefficient. Intuitively, this would seem to be a result of scale, specialization, and comparative advantage. That is, the captive finance companies in the auto sector are generally owned by auto manufacturers. Auto loan pools issued by captive finance companies are quite large; these originators are also quite well known. Banks, the omitted group, do not seem to have the advantages with this collateral type that they do with credit cards, at least in comparison to the captives. Thus, the evidence would seem to indicate that the market does attach some importance to who originated a loan pool,

but that the advantage does not always go to the banks. Rather, the advantage goes to the originator with the most expertise in making a particular type of loan. Credit card pools are unsecured loans; they have no physical collateral to speak of. The receivables are from credit lines which could result in increased receivables even if the financial condition of the borrower deteriorates. These types of assets may require the type of information about its clients and monitoring expertise a bank possesses. Auto loans, on the other hand, are secured. They usually require a down payment and cannot be increased if the financial condition of the borrower changes. Knowledge of the borrower such as a bank may possess may not be as important with an auto loan as large scale, efficient, and effective monitoring and collection systems and procedures. With an auto captive, such systems are dedicated to this single task. Thus the difference between the auto and credit card markets indicate that originator type is a factor in pricing, and that comparative advantage--which can change by the type of loan--is an important issue.

The home equity market exhibits characteristics much like that of credit cards. Like credit cards, the collateral often consist of revolving lines of credit. However, these are secured loans. Nonetheless, banks appear to have a comparative advantage. This, again, may be informational, since banks may have booked the first mortgage initially. It may also reflect a strong clientele effect. Banks are generally thought to have a higher "quality" of home equity borrower (see note 3, Chapter 4, and ASR, April 1, 1992).

By dividing the sample into collateral groups, it is possible to more accurately see how the securities of different collateral types behave, particularly regarding prepayment and prepayment default risk. Home equity, in particular, would be expected to be more

sensitive to prepayment risk than autos or credit cards. It was shown earlier that the significance of the collateral dummy, for home equity at least, was probably due to increased sensitivity to prepayment risk. Typically, home equity lines are refinanced when the first lien is refinanced. For example, in 1992, when successive drops in interest rates triggered an increase in mortgage refinancings, "conditional prepayment rates on some home equity ABSs rose to 30% or more from between 15% to 20%, according to prepayment data prepared by Merrill Lynch (ASR, February 1, 1993, p. 1). In contrast, prepayments for auto and credit card pools are more stable in the face of interest rate changes (see Finnerty, 1993, p. 36).

Home equity might be less sensitive to default prepayments. A banker comments that home equity loans "are 'the jewels' in banks' consumer loan portfolios. . . . [T]hey are often secured by primary residences, provide a high yield to the lender and have a lower default rate than other consumer loans" (ASR, February 1, 1993, p. 1).

The results generally support these conjectures. For example, credit card pools and home equity pools have opposite coefficients regarding the slope of the yield curve (SLOPE). Although only the credit card slope coefficient is significant, it is clear that home equity, as expected, faces more severe prepayment risk. The coefficient on slope is -0.23 for home equity, contrasting with 0.065 for credit cards and -0.044 for auto (the T-statistic on slope for home equity is -1.64). Prepayment does not seem to be a concern with credit card pools. In fact, the positive and significant slope coefficient indicates that a credit card pass-through behaves like a non-callable, amortizing security; it exhibits positive convexity. The negative coefficients on the controlled amortization and the bullet

credit card structures indicate a preference for these less-amortizing structures in steep, positive slope environments.

With regard to the proxy for default risk (IP), only home equity exhibits an insignificant relation, and it also has the smallest coefficient. Home equity loans do seem to exhibit less prepayment default risk. Finally, notice that the size of a credit card issue is important; the coefficient is positive. The premium required on a larger credit card issue perhaps indicates that a larger issue contains a higher percentage of questionable receivables.

The results of the relative spread model are shown in Table 20, and are generally consistent with the absolute spread model.

Credit Enhancement

Sample

One of the most important elements of an ABS is credit enhancement--the type and amount of guaranty that payments will be ultimately be made to investors. It is through credit enhancement that the majority of these issues can achieve a very high credit rating despite the credit quality of the originator or even the collateral.

Credit enhancement information was available only for a subset of the sample. Tables 14 and 15 present some descriptive statistics on this sample. Because it was often possible to find information on type of enhancement (and the identity of the insurer) but not the specific amount, the top of Table 14 looks simply at the frequencies of occurrence of particular types of enhancement per issue. In this sample there are 259 issues. The enhancement has been divided into enhancement that is provided by the originator

("inside" enhancement) and that provided by an "outsider," in the form of outside insurance or a sold subordinate tranche. Within these categories, the type of enhancement is delimited according whether it applies to the A tranche(s) primarily, or whether it applies to B only.

In terms of frequency, the most popular form of enhancement is a sold subordinate tranche, present in over 30% of the issues. Retained subordinate portions of an issue are also popular--20% of these issue have a retained tranche.[12] Thus the senior/subordinate structure is employed in about 50% of these issues.

Outside guarantees by monoline insurers (such as MBIA, CAPMAC, FSA, FGIC[13]) on A are present in 19% of the issues, and letters of credit (very often by foreign banks[14]) on A protect 23% of the issues. A number of these banks have suffered rating downgrades over the years, creating an event risk problem for the securities they have written letters of credit to protect. One result has been the almost total disappearance of the bank LOC as a credit enhancement device by 1992 and growing popularity for cash collateral accounts, a method lauded for being without event risk. Thus it will be of interest to see if cash collateral accounts reflect a yield premium for this protection.

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[12]In some cases these retained tranches are later sold, often in the private market. But at the time of issue they are retained by the originator.

[13]Municipal Bond Investors Insurance Corp, Capital Markets Assurance Co., Financial Security Assurance, and Financial Guaranty Insurance Corp., respectively.

[14]Among the major players are State Street B&T, Union Bank of Switzerland, Credit Suisse, Banque Nationale de Paris, Bayerische Vereninsbank, Sumitomo Bank, Dai Ichi Kangyo Bank, Industrial Bank of Japan, Fuji Bank, and Sanwa Bank.

Of all the issues with credit enhancement information, 20.9% of the principal dollar value at issue is protected (bottom Table 14). By far the largest category contributing to this figure is outside enhancement, particularly monoline insurance, which often covers 100% of an issue or a tranche. This skewing can be seen more clearly in Table 15, which looks at enhancement in a slightly different way. In this Table, we consider only issues for which we know the enhancement as a percentage of total issue. Each row gives simple statistics for a particular type of enhancement--only when that enhancement is actually utilized. For example, for all issues for which there is a retained subordinate class (i.e., not sold) and for which we have information on the amount of that retained class (a total of 49 issues), on average 10.43% of issue principal is retained by the originator. As we scrutinize the various types of enhancement, clearly the letters of credit (LOC) and guaranties are quite large vis-à-vis cash collateral accounts, for example.

Because the default amounts on these issues are relatively predictable, and certainly fairly low, the high amounts of coverage provided by 100% guaranties or LOCs is, at the margin, fairly cheap and not terribly important. For this reason the credit enhancement figures used in the regression are all in log form, in order to reduce the contribution of excessively high enhancement levels. It is entirely possible, for example, for an issue to have over 100% total coverage, because these types of enhancement overlap. There may be a cash collateral account and a 100% insurance "wrap" (coverage of principal and interest on all tranches), because the cash collateral account is in a first loss position and reduces the cost of the third party insurance. A cash collateral account, unlike a LOC, requires an actual provision of cash, set aside in a separate account, by

either the originator or a third party. Cash collateral accounts do have a significant marginal cost, and the amounts of this enhancement (9.67% of total issue provided by an outside guarantor on A classes, for example) more accurately reflect a true credit enhancement requirement. Three times expected default, for example, might be sufficient.[15]

Results

The importance of credit enhancement to ABS pricing was tested with the following model:

$$SPREAD_i = \alpha_0 + \alpha_1 I_i + \alpha_2 VOL_i + \alpha_3 SLOPE_i + \alpha_4 SIZE_i + \alpha_5 LIFE_i + \alpha_6 TIME_i + \alpha_7 IP_i + \alpha_8 RATE_i + \alpha_9 COLLAT_i + \alpha_{10} CSPR_i + \alpha_{11} INTERACTIVES_i + \alpha_{12} INSURE_i \quad (6)$$

The vector of credit enhancement variables was characterized in two ways. First, all of the types of enhancement--cash collateral on A, letter of credit on A, outside guaranty on A, and so on--were employed. This was done to investigate if the specific type of enhancement was priced differently. Second, the various types of enhancement were aggregated into four groups--outside provided enhancement on A, outside on B, inside on A, and inside on B. This allows a clearer picture of what tendency the enhancement is demonstrating. Results are presented in Table 16 for A tranches. As regards credit enhancement, senior and subordinate tranches would not be expected to behave the same,

[15]Cash collateral accounts, and more often reserve or spread accounts, are often not completely funded at issue. They may start with a cash outlay equal to 2% of principal, for example, and grow from excess spread until some stated maximum ("cap") is reached, perhaps 5%. Because chances of default and major changes in prepayment rates are unlikely close to issue, there is not a serious risk in this method. In this study we have utilized the cap if it is known, not the initial amount in the account.

because the particular forms of enhancement protect particular tranches of the issue. The sample size has been greatly reduced, with only 219 A tranches.[16]

The coefficients, when compared to the earlier regressions such as in Table 8, are very similar. The only sign changes are for the Bond•Volatility and CA•Slope interactives. Neither is significant. There is only one bond in the sample, so only one interactive is constructed for the bond. The A tranche regression appears to be performing adequately. Tranche rating (although two rate categories have been lost) and collateral are quite similar to earlier regressions. Rating is very important to pricing.

Collateral. The collateral result is of particular interest after the earlier discussion of the first regression (Table 8). Recall there that there were two specific collateral types--home equity and mobile homes--that showed significance. It was shown that the significance for home equity was due to an increased sensitivity to the borrower options. Mobile home collateral, however, continued to show significance even after interacting that dummy with the proxies for the borrower options--VOL, SLOPE, and IP. Now (Table 16), with the introduction of the credit enhancement variables, the significance of the mobile home collateral dummy has disappeared. It appears that the amount of credit enhancement is significantly higher for mobile homes, a result expected from even a cursory reading of the trade press. Mobile home issues require large amounts of credit enhancement. For example, the mean percentage of total issue covered by a sold subordinate tranche, from Table 15, is 11.27%. The percentages for mobile home issues

[16]There are 40 B tranches with sufficient information to be included in a regression. However, with the small sample size and a large number of variables, collinearity is a problem with the B tranche regression, and it is not shown.

that had a sold subordinate tranche (the most popular credit enhancement technique for a mobile home issue) are substantially higher: a range from 16% to 34.9% with an average of 22.5%. Thus, the collateral dummy appears to have been capturing the poor quality on average of a mobile home pool, a quality that requires an enormous amount of credit enhancement. This is distinct from what is occurring with home equity collateral where it appears to be the sensitivity of the underlying borrowers to prepayment risk.

Sufficiency of credit rating. The examination of credit enhancement further explores the sufficiency of credit rating to assess the risk of an asset-backed issue. Previous results in this study have already indicated that the rating of the originator and the form of the originator are important to pricing. This could be because all of these factors have implications for pool quality and performance that matter to investors because credit rating rates the ability of the structure to protect principal and does not consider the probability of payout events and other timing effects resulting from a poor pool of assets or a weak structure. The results here also suggest additional information is employed by the market--namely certain credit enhancement information.

Because the rating process on an ABS "starts with the rating desired" and enhancement is added to reach that point, the amount of enhancement may be a signal of pool quality. The more enhancement required to bring the tranche up to the desired rating, the worse (ceteris paribus) the collateral and/or structure must be.[17]

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[17]This is opposite of normal signalling models. For example, Thakor's (1982) model "borrowers with higher intrinsic default risks choose successively lower levels of insurance coverage" (p. 728). Only the higher quality borrowers can afford the high insurance. But in Thakor's model, it is assumed that credit ratings are precluded.

This appears to be the case because the credit enhancement variables generally enter the equation positively. Four credit enhancement categories enter significantly positive. The amount of the issue guaranteed by a third party (outsider) in the form of insurance or a LOC, and/or the amount of the issue retained, and/or the level of overcollateralization provide useful information to the market. Only one credit enhancement variable enters negatively and significantly--the amount of outside guaranty on a B tranche. The reason for this is not entirely clear, but credit enhancement on the subordinate tranche seems to be a positive signal to the investors in A tranches. Perhaps the expense of B enhancement would not be undertaken unless the quality was high and the risk was low.

The results seem to support Benston's (1992) observation that ". . . investors may not fully trust the credit risk guarantees, resulting in a credit risk premium." The results also support previous empirical work by Liu and Thakor (1984) and Ederington, Yawitz, and Roberts (1987) that the market uses more than ratings in its evaluation of a bond's creditworthiness. But it is important to note that with an ABS the creditworthiness issue is probably not so much about principal protection as it is about a change in the timing of when principal is received because of the insurer's guarantee.

Inside versus outside insurance: the possibility of moral hazard. The regression with the specific enhancement variables seems to offer mixed signals on the importance of inside versus outside provided insurance. Generally, tests of the coefficients cannot reject the hypothesis that similar forms of insurance do not differ by provider (inside versus outside). An exception is the straight guaranty ($F = 5.29$, significant at 5%). An

outside provided guaranty requires a yield premium, an inside guarantee has a negative coefficient. This would be consistent with a moral hazard argument--the originator retaining a subordinate position increases incentives to book and sell high quality loans, as well as maintain vigilant monitoring. However, we do not see the significant difference with the other forms of credit enhancement. Generally the signs and levels of the point estimates are consistent with the moral hazard argument, but the retained (Sub Percent Retained) versus sold subordinate tranche (Sub Percent sold) is a significant exception.

The right hand side of Table 16 may make the credit enhancement picture a little clearer. In this specification, the credit enhancement variables are grouped by whether they are provided by the originator (inside) or a third party insurer (outside), and also whether the insurance is on a B tranche or on the A tranches. Only the outside provided insurance on A tranches is a significant factor in pricing--and the more enhancement the higher the yield. Inside enhancement on A is also positive, although not significant. Importantly, the coefficient on total insurance provided by an outsider on A is higher than the coefficient on inside insurance provided. An F test confirms that the two coefficients are not equal ($F = 4.46$), supporting the moral hazard argument.

In contrast, the enhancement on B tranches, whether provided by the insider or an outsider, have negative coefficients. Although the coefficients are not significant, the signs suggest that enhancement on a subordinate tranche offers further protection to the owners of A securities and it might reduce required yield. However, more enhancement on an A tranche signals lower pool quality and increases the required yield.

Types of insurance. While there is some evidence of a difference between inside and outside provided insurance, there may also be distinctions across types of insurance: for example, between LOC and a guaranty; between cash collateral accounts and other non-cash forms of insurance; or between those forms of insurance (LOC/Guarantee) and the use of a subordinate tranche.

It has been suggested that certain forms of enhancement are less sensitive to event risk. One distinction is between banks and monoline insurers. Unlike banks, the common provider of LOC, no monoline insurer (common provider of outside guarantees) has ever been downgraded and they are not subject to potential losses from other risk-carrying lines of business. However, there appears to be little distinction made in pricing between enhancement provided in the form of a letter of credit or outside insurance. An F test cannot reject the hypothesis that the two forms of enhancement have the same coefficient ($F = 0.0421$). The point estimate of the Outside LOC on A, however, is slightly higher than that on Outside Guarantee. This would be the relationship we expect.

Also, a cash collateral account has frequently been lauded as being without event risk altogether, because once the cash has been provided it cannot be downgraded. The coefficient on cash collateral accounts (on A) is much less than either outside insurance or LOC (0.015 for cash collateral, 0.078 for outside insurance, and 0.0.83 for a letter of credit). This is consistent with the less event risk argument, but an F test cannot reject the hypothesis that the coefficients are equal.

Finally, a retained subordinate class may offer advantages in either direction. Compared to third party enhancement, the retention of a subordinate piece of the pool

might be expected to decrease moral hazard. On the other hand, Bhattacharya (1989) points out that a subordinate piece is not a perfect substitute for other credit enhancement devices because of the cash flow limitations discussed in Chapter 4: the ability of the subordinated cash flows on hand to meet shortfalls in the senior class. The retained subordinate piece form of credit enhancement has a slightly lower coefficient than LOC or outside insurance (consistent with the moral hazard argument), but the sold subordinate tranche has an even lower coefficient (inconsistent with this argument). An F test cannot reject the hypothesis that the retained subordinate tranche coefficient equals the outside LOC or guarantee. Thus there is little evidence that either effect--the reduction in moral hazard or the possible shortfall in cash flow--is important in pricing a subordinate tranche.

In general, there is little evidence that the market distinguishes between the type of enhancement on a particular tranche. The power of the tests may be too weak on this limited sample, or the enhancement type may not matter.

The results of the credit enhancement regressions indicate that the market does use credit enhancement information, particularly the amount of third party insurance, in assessing pool quality.[18] The results are consistent with two hypotheses: (1) Credit rating is an insufficient statistic for default risk, or (2) The quality of a pool is important

[18]It may be of interest to know that the credit enhancement effect is quite robust to dividing the sample up into various subgroups or adding additional variables. Credit enhancement is still important when the regression is limited to AAA rated issues only, when the regression is run on subsamples divided by structure or collateral, or when originator rate is added to the regression. When the total amount of credit enhancement is regressed on the dummies for rating, structure, and collateral, only the dummies for home equity and mobile homes were significant, indicating these categories require more credit enhancement on average. Note too that collinearity tests were conducted on the A tranche regression and indicate no problem except the previously described relationship between the intercept and the interest rate level.

beyond default risk because a it is more probable that a low quality pool will lead to future interruptions or changes in expected cash flows. Thus, it is more accurate to say that credit rating does not, and probably can not, assess all the risks inherent in an asset-backed security. These additional risks may be related to pool quality but cannot necessarily be classified as credit risks. Because of credit enhancement, low pool quality or a weak ABS structure more often will result in unexpected timing changes in the receipt of interest and principal. If these timing changes are not diversifiable and not desired by the investors, they will be priced.

While the market appears to consider the amount of third party insurance, there appears to be little difference between types of third party enhancement. This is important, because it means there is no advantage with any particular form of insurance and the issuer can use the least expensive.

The results for the relative spread model are comparable and are shown in Table 21.

TABLE 8: DETERMINANTS OF ABS ABSOLUTE SPREAD
OLS REGRESSION (DEPENDENT VARIABLE = ABSOLUTE YIELD SPREAD)

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	-0.0667	-0.279	
I	-0.0033	-0.200	
VOL	0.7882	3.675	***
CA*VOL	-0.3291	-1.125	
BULLET*VOL	-0.8194	-1.999	**
BONO*VOL	-0.7002	-1.277	
SLOPE	-0.0179	-0.673	
CA*SLOPE	-0.0809	-2.373	**
BULLET*SLOPE	-0.0240	-0.665	
BONO*SLOPE	-0.0766	-0.260	
SIZE	0.0052	0.238	
LIFE	0.0827	2.276	**
TIME	0.0144	4.001	***
CSPR	0.5975	7.450	***
IP	-0.0198	-2.591	***
CA*IP	0.0019	0.162	
BULLET*IP	0.0071	0.385	
BONO*IP	0.1170	0.652	
RATE:			
Aa1/Aa2	0.3386	5.646	***
Aa3/A1	0.4481	3.579	***
A2	0.1965	1.953	*
A3 and lower	0.7702	5.415	***
COLLAT:			
Credit Card Retail	0.0097	-0.209	
Auto/Truck	0.0577	1.449	
Home Equity	0.4607	7.991	***
Manf Hous/Mobile Hm	0.1913	2.836	***
Misc Commerc	0.1937	1.979	
Misc Retail	0.2095	3.450	***
FIRST:			
First Issue	0.0827	1.924	*
First Collateral	-0.0941	-0.830	
CALL	-0.0312	-0.531	
FREQ:			
Pmts 4 X Yr	0.0762	1.100	
Pmts 2 X Yr	-0.0780	-1.880	*
BOUM	0.2297	2.394	**
MULTA	-0.0593	-1.202	

N = 452
DEP MEAN = 1.17947
ADJ R SQUARE = 0.6874
F = 27.912
PROB > F = 0.0001

OMITTED: Aaa Tranche Rating, Credit Card Collateral, Pass-through structure

*** = SIGNIFICANT AT 1%.
** = SIGNIFICANT AT 5%.
* = SIGNIFICANT AT 10%.

TABLE 9: COLLATERAL BY YEAR (SAMPLE)

YEAR	COLLATERAL TYPE	ISSUE $ (M)	% of TOTAL	TRANCHES	% of TOTAL
1985	Misc Commercial	$338.30	0.24%	2	0.50%
1985	TOTAL	$338.30	0.24%	2	0.45%
1986	Auto/Truck	$5,466.40	3.96%	9	2.26%
	Misc Commercial	$380.20	0.28%	2	0.50%
1986	TOTAL	$5,846.60	4.23%	11	2.76%
1987	Credit Cards	$1,999.50	1.45%	5	1.26%
	Auto/Truck	$4,331.10	3.14%	17	4.27%
	Manuf Hous/Mobile Home	$183.50	0.13%	2	0.50%
	Misc Commercial	$173.14	0.13%	3	0.75%
	Misc Retail	$432.10	0.31%	2	0.50%
1987	TOTAL	$7,119.34	5.16%	29	7.29%
1988	Credit Cards	$4,375.00	3.17%	10	2.51%
	Credit Card Retail	$2,145.00	1.55%	8	1.51%
	Auto/Truck	$4,714.40	3.41%	21	5.28%
	Manuf Hous/Mobile Home	$592.70	0.43%	6	1.51%
	Misc Commercial	$55.00	0.04%	2	0.50%
	Misc Retail	$683.50	0.48%	4	1.01%
1986	TOTAL	$12,545.60	9.08%	49	12.31%
1989	Credit Cards	$8,572.00	6.21%	16	4.02%
	Credit Card Retail	$2,550.00	1.85%	7	1.76%
	Auto/Truck	$4,858.43	3.52%	18	4.52%
	Home Equity	$208.20	0.15%	1	0.25%
	Manuf Hous/Mobile Home	$873.00	0.63%	7	1.76%
	Misc Retail	$529.70	0.38%	3	0.75%
1969	TOTAL	$17,592.33	12.74%	52	13.07%
1990	Credit Cards	$16,965.00	12.29%	36	9.05%
	Credit Card Retail	$3,050.00	2.21%	7	1.76%
	Auto/Truck	$11,542.66	8.36%	19	4.77%
	Home Equity	$2,163.00	1.57%	12	3.02%
	Manuf Hous/Mobile Home	$806.40	0.58%	8	2.01%
	Misc Retail	$492.80	0.36%	5	1.26%
1990	TOTAL	$35,018.86	25.36%	87	21.86%
1991	Credit Cards	$19,281.60	13.96%	39	9.80%
	Credit Card Retail	$2,350.00	1.70%	5	1.26%
	Auto/Truck	$14,928.50	10.81%	28	7.04%
	Home Equity	$5,666.28	4.10%	27	8.78%
	Manuf Hous/Mobile Home	$813.38	0.88%	10	2.51%
	Misc Commercial	$1,313.00	0.95%	3	0.75%
	Misc Retail	$448.70	0.33%	3	0.75%
1991	TOTAL	$44,902.42	32.52%	115	28.89%
1992	Credit Cards	$7,353.00	5.32%	16	4.02%
	Credit Card Retail	$1,631.00	1.18%	8	2.01%
	Auto/Truck	$13,408.45	9.71%	27	6.78%
	Home Equity	$2,141.71	1.55%	25	6.28%
	Manuf Hous/Mobile Home	$1,332.20	0.96%	25	8.28%
	Misc Commercial	$3,351.80	2.43%	3	0.75%
	Misc Retail	$242.70	0.18%	2	0.50%
1992	TOTAL	$29,460.86	21.33%	106	28.63%

TABLE 10: CASH FLOW STRUCTURE BY YEAR (SAMPLE)

YEAR	CASH FLOW STRUCTURE	$ TOTAL (Million)	% OF TOTAL	TRANCHES	% OF TOTAL
1985	Bullet	$338.30	0.22%	2	0.44%
1985	TOTAL	$338.30	0.22%	2	0.44%
1986	Controlled Amortization	$5,872.10	3.74%	10	2.21%
	Bullet	$174.50	0.11%	1	0.22%
1986	TOTAL	$5,846.60	3.85%	11	2.43%
1987	Pass-Through	$1,537.00	1.01%	5	1.11%
	Controlled Amortization	$2,762.64	1.82%	12	2.65%
	Bullet	$2,528.30	1.67%	9	1.99%
	Bond	$291.40	0.19%	3	0.66%
1987	TOTAL	$7,119.34	4.69%	29	6.42%
1988	Pass-Through	$5,884.30	3.88%	25	5.53%
	Controlled Amortization	$1,860.30	1.23%	10	2.21%
	Bullet	$4,562.50	3.01%	12	2.65%
	Bond	$238.50	0.16%	2	0.44%
1988	TOTAL	$12,545.60	8.26%	49	10.84%
1989	Pass-Through	$7,898.20	5.20%	31	6.86%
	Controlled Amortization	$4,611.33	3.04%	11	2.43%
	Bullet	$5,082.80	3.35%	10	2.21%
1989	TOTAL	$17,592.33	11.59%	52	11.50%
1990	Pass-Through	$15,319.86	10.09%	45	9.96%
	Controlled Amortization	$9,060.00	5.97%	20	4.42%
	Bullet	$10,640.00	7.01%	22	4.87%
1990	TOTAL	$35,019.86	23.07%	87	19.25%
1991	Pass-Through	$22,726.42	14.97%	72	15.93%
	Controlled Amortization	$10,267.00	6.76%	19	4.20%
	Bullet	$10,909.00	7.19%	24	5.31%
1991	TOTAL	$43,902.42	28.92%	115	25.44%
1992	Pass-Through	$17,525.36	11.54%	80	17.70%
	Controlled Amortization	$6,822.90	4.49%	15	3.32%
	Bullet	$5,112.60	3.37%	12	2.65%
1992	TOTAL	$29,460.86	19.40%	107	23.67%

TABLE 11: DETERMINANTS OF ABS ABSOLUTE SPREAD EFFECTS OF B INTERACTIVES

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	0.0294	0.122	
I	-0.0032	-0.195	
VOL	0.6674	3.128	***
CA*VOL	-0.3082	-1.109	
BULLET*VOL	-0.8917	-1.813	
BOND*VOL	-0.6917	-1.224	
SLOPE	-0.0083	-0.312	
CA*SLOPE	-0.0804	-2.168	**
BULLET*SLOPE	-0.0408	-0.985	
BOND*SLOPE	-0.0998	-0.322	
SIZE	-0.0033	-0.161	
LIFE	0.0818	2.105	**
TIME	0.0146	4.228	***
CSPR	0.5518	7.098	***
IP	-0.0158	-2.038	**
CA*IP	-0.0053	-0.478	
BULLET*IP	0.0082	0.403	
BOND*IP	0.1200	0.645	
RATE:			
Aa1/Aa2	0.3730	8.237	***
Aa3/A1	0.3916	3.875	***
A2	0.3179	3.380	***
A3 and lower	0.9664	5.071	***
COLLAT:			
Credit Card Retail	-0.0171	-0.362	
Auto/Truck	0.0436	1.151	
Home Equity	0.4030	8.275	***
Manf Hous/Mobile Hm	0.1459	2.156	**
Misc Commerc	0.1938	1.678	*
Misc Retail	0.1878	3.248	***
FIRST:			
First Issue	0.0837	1.824	*
First Collateral	-0.0958	-0.952	
CALL	-0.0821	-1.125	
FREQ:			
Pmts 4 X Yr	0.0549	0.830	
Pmts 2 X Yr	-0.0922	-2.322	**
BOUM	0.0062	0.040	
BOUM*VOL	4.0342	3.100	***
CA*BOUM*VOL	-2.9525	-1.825	
BULLET*BOUM*VOL	-2.9581	-2.247	**
BOUM*SLOPE	-0.1938	-2.288	**
CA*BOUM*SLOPE	0.0993	0.775	
BULLET*BOUM*SLOPE	0.2791	3.022	***
BOUM*IP	-0.0703	-2.313	**
CA*BOUM*IP	0.1283	2.825	***
BULLET*BOUM*IP	-0.0228	-0.485	

N = 447
OEP MEAN = 1.17641
AOJ R SOUARE = 0.8803

OMITTEO: A class, Aaa RATE, Credit Card, Pass-thru
F = 23.582

TABLE 12: DETERMINANTS OF ABS ABSOLUTE SPREAD
EFFECT OF REPUTATION AND ORIGINATOR RATE

	REPUTATION			ORIGINATOR RATE VARIABLES		
VARIABLE	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	-0.0447	-0.188		-0.2078	-0.874	
I	0.0086	0.546		0.0251	1.513	
VOL	0.8098	2.903	***	0.6538	3.216	***
CA*VOL	-0.2457	-0.985		-0.2023	-0.628	
BULLET*VOL	-0.7007	-1.647	*	-1.3370	-4.225	***
BONO*VOL	-0.8220	-1.472				
SLOPE	-0.0034	-0.125		-0.0398	-1.627	
CA*SLOPE	-0.0755	-2.172	**	-0.0441	-1.332	
BULLET*SLOPE	-0.0545	-1.260		0.0191	0.623	
BONO*SLOPE	-0.1685	-0.559				
SIZE	-0.0047	-0.284		0.0031	0.206	
LIFE	0.0747	1.676	*	0.0325	0.985	
TIME	0.0185	5.629	***	0.0161	5.339	***
CSPR	0.5461	7.081	***	0.4810	6.009	***
IP	-0.0180	-2.075	**	-0.0263	-3.237	***
CA*IP	-0.0018	-0.151		0.0135	1.174	
BULLET*IP	0.0208	0.998		0.0238	1.217	
BONO*IP	0.1671	0.875				
RATE:						
Aa1/Aa2	0.3711	6.746	***	0.2810	4.350	***
Aa3/A1	0.3938	3.947	***	0.3165	3.270	***
A2	0.3311	3.658	***	0.2594	2.810	***
A3 and lower	0.9342	5.166	***	0.4491	4.123	***
COLLAT:						
Credit Card Retail	-0.0147	-0.326		0.0085	0.187	
Auto/Truck	0.0665	1.810	*	0.0767	2.051	**
Home Equity	0.3987	7.921	***	0.3560	7.233	***
Manf Hous/Mobile Hm	0.1645	2.507	**	0.3115	3.803	***
Misc Commerc	0.1351	1.148		0.1133	1.671	*
Misc Retail	0.1825	3.446	***	0.2195	3.270	***
BOUM	-0.0552	-0.368		-0.1966	-1.151	
BOUM*VOL	3.8558	2.995	***	5.8940	4.238	***
CA*BOUM*VOL	-2.5601	-1.446		-4.2200	-3.308	***
BULLET*BOUM*VOL	-2.6935	-2.057		-3.0697	-2.308	**
BOUM*SLOPE	-0.1495	-1.846	*	-0.1411	-1.875	*
CA*BOUM*SLOPE	0.0713	0.583		0.2224	2.355	**
BULLET*BOUM*SLOPE	0.2357	2.758	***	0.2481	2.929	***
BOUM*IP	-0.0897	-2.158	**	-0.1112	-3.086	***
CA*BOUM*IP	0.1381	2.882	***	0.1606	2.852	***
BULLET*BOUM*IP	-0.0190	-0.398		0.0240	0.503	
REP	-0.0137	-3.031	***			
ORIG RATE: A1-A3				0.0703	1.836	*
ORIG RATE: Baa1-Baa3				0.0794	2.081	**
ORIG RATE: Ba1-Ba3				0.0448	0.816	
ORIG RATE: B1-Caa1				0.1483	1.849	*
	N = 452			N = 312		
	DEP MEAN = 1.17947			DEP MEAN = 1.11282		
	ADJ R SQUARE = 0.8825			ADJ R SQUARE = 0.7539		
	F = 28.518			F = 26.085		

OMITTED: Aaa, Credit Card, Pass-thru, Orig Rate Aa3 and up

TABLE 13: DETERMINANTS OF ABS ABSOLUTE SPREAD
PANELS BY COLLATERAL WITH ORIGINATOR TYPE (A TRANCHES ONLY)

	COLLATERAL: CREDIT CARDS			COLLATERAL: AUTO/TRUCK LOANS			COLLATERAL: HOME EQUITY		
VARIABLE	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	0.0031	0.011		-0.3058	-1.067		-1.6413	-0.810	
I	-0.0127	-0.525		0.0428	1.858	*	-0.1305	-1.144	
VOL	0.8641	1.808	*	0.8789	4.780	***	-0.2366	-0.315	
CA*VOL	-0.8204	-2.559	**	-0.2837	-0.597				
BULLET*VOL	-1.8276	-4.547	***	0.0848	0.289				
BONO*VOL				0.0013	0.005				
SLOPE	0.0857	1.854	*	-0.0448	-1.073		-0.2373	-1.640	
CA*SLOPE	-0.1366	-4.101	***	-0.0389	-0.498				
BULLET*SLOPE	-0.0766	-2.102	**	-0.1032	-2.881	***			
BONO*SLOPE				-0.5305	-3.899	***			
SIZE	0.0720	2.332	**	0.0126	0.715		-0.0231	-0.588	
LIFE	0.1185	3.248	***	0.1037	1.187		0.1528	1.702	*
TIME	-0.0028	-0.607		0.0212	3.204	***	0.1140	2.187	**
CSPR	0.5878	8.542	***	0.4331	4.272	***	1.2832	3.168	***
IP	-0.0460	-1.823	*	-0.0254	-2.445	**	-0.0178	-0.880	
CA*IP	0.0213	0.818		0.0043	0.180				
BULLET*IP	0.0183	0.835		0.0583	1.817	*			
BONO*IP				0.3863	4.487	***			
RATE:									
Aa1/Aa2				0.1328	2.533	**	1.0159	8.878	***
ORIGTP:									
Thrift Originator	0.2227	6.332	***	-0.0337	-0.587				
Finance Co. Orig	0.0400	1.254		0.1924	2.332	**	0.1054	1.808	*
Captiva Finance Co.	0.3954	7.125	***	-0.1161	-2.668	***	0.2335	2.208	**
Other Originator				-0.0759	-0.803				
	N = 88			N = 137			N = 51		
	OEP MEAN = 0.81284			OEP MEAN = 1.02518			OEP MEAN = 1.53403		
	ADJ R SQUARE = 0.5847			ADJ R SQUARE = 0.3727			ADJ R SQUARE = 0.4815		
	F = 8.888			F = 4.873			F = 5.221		

OMITTED DUMMIES: Aaa Issue Rating, Pass-through structure, Bank Originator.

TABLE 14: SUMMARY STATISTICS, CREDIT ENHANCEMENT SAMPLE TOTAL ISSUES IN SAMPLE = 259

SIMPLE FREQUENCIES BY ISSUE

	N	% OF TOT NUMBER OF ISSUES
TYPE OF CREDIT ENHANCEMENT:		
ENHANCEMENT PROVIDED BY ORIGINATOR	123*	
RETAINED SUBORDINATE TRANCHE	53	20.23%
CASH COLLATERAL ACCOUNT ON B ONLY	9	3.44%
CASH COLLATERAL ACCOUNT ON A	26	9.92%
RESERVE/SPREAD ON B ONLY	6	2.29%
RESERVE/SPREAD ON A	25	9.54%
INSIDE GUARANTY ON B ONLY	3	1.15%
INSIDE GUARANTY ON A	6	2.29%
LOC ON A	3	1.15%
OVERCOLLAT. ONLY SOURCE OF CE	2	0.76%
ENHANCEMENT PROVIDED BY OUTSIDER	189*	
SOLO SUBORDINATE TRANCHE	83	31.68%
CASH COLLATERAL ACCOUNT ON B ONLY	6	2.29%
CASH COLLATERAL ACCOUNT ON A	3	1.15%
OUTSIDE GUARANTY ON B ONLY	9	3.44%
OUTSIDE GUARANTY ON A	50	19.08%
LOC ON B	9	3.44%
LOC ON A	62	23.66%

TOTAL AVERAGE CREDIT ENHANCEMENT BY TYPE (% OF TOTAL ISSUE DOLLARS IN SAMPLE)

TOTAL AVG CE PROVIDED ON B BY ORIGINATOR		0.52%
TOTAL AVG CE PROVIDED ON B BY OUTSIDE ENHANCEMENT		0.72%
TOTAL AVG CE PROVIDED ON A BY ORIGINATOR		1.05%
TOTAL AVG CE PROVIDED ON A BY OUTSIDE ENHANCEMENT		18.64%
TOTAL AVERAGE CE PROVIDED BY ISSUE		20.93%

* Totals will not necessarily equal total of categories listed because more than one type of credit enhancement can be utilized per issue.

TABLE 15: UTILIZED CREDIT ENHANCEMENT, SIMPLE STATISTICS PERCENTAGE OF ISSUE DOLLARS

PERCENTAGE CREDIT ENHANCEMENT PROVIDED, IF THIS TYPE OF ENHANCEMENT UTILIZED (% OF TOTAL ISSUE)

	MEAN	MEDIAN	MINIMUM	MAXIMUM	N
ENHANCEMENT PROVIDED BY ORIGINATOR					
RETAINED SUBORDINATE TRANCHE	10.43	9.24	4.00	24.00	49
CASH COLLATERAL ACCOUNT ON B ONLY	5.11	4.75	2.00	10.00	9
CASH COLLATERAL ACCOUNT ON A	11.55	10.00	3.50	35.00	25
RESERVE/SPREAD ON B ONLY	7.08	6.95	6.00	8.50	6
RESERVE/SPREAD ON A	5.65	5.00	0.15	23.00	25
INSIDE GUARANTY ON B ONLY	24.00	24.00	15.00	33.00	2
INSIDE GUARANTY ON A	5.80	5.00	5.00	9.00	5
LOC ON A	10.75	10.75	9.50	12.00	2
OVERCOLLAT. ONLY SOURCE OF CREDIT ENHANCE	41.55	41.55	24.00	59.09	2
ENHANCEMENT PROVIDED BY OUTSIDER					
SOLD SUBORDINATE TRANCHE	11.27	10.00	3.51	34.94	83
CASH COLLATERAL ACCOUNT ON B ONLY	6.58	7.00	2.00	9.50	6
CASH COLLATERAL ACCOUNT ON A	9.67	11.00	5.00	13.00	3
OUTSIDE GUARANTY ON B ONLY	9.13	10.00	1.10	14.00	9
OUTSIDE GUARANTY ON A	81.20	100.00	1.00	100.00	49
LOC ON B	7.33	5.40	1.34	14.00	9
LOC ON A	14.86	12.00	1.50	100.00	59

TABLE 16: DETERMINANTS OF ABS ABSOLUTE SPREADS
EFFECT OF CREDIT ENHANCEMENT VARIABLES (A TRANCHES ONLY)

SPECIFIC CREDIT ENHANCEMENT VARIABLES				GROUPED CREDIT ENHANCEMENT VARIABLES			
VARIABLE	COEFFICIENT	T STAT	SIG	VARIABLE	COEFFICIENT	T STAT	SIG
INTERCEPT	-0.4228	-0.899		INTERCEPT	-0.4930	-1.047	
I	-0.0005	-0.021		I	0.0239	0.961	
VOL	0.7145	1.904	*	VOL	0.6435	1.646	
CA*VOL	-1.1859	-2.538	**	CA*VOL	-0.9489	-2.058	**
BULLET*VOL	-1.1083	-2.012	**	BULLET*VOL	-1.1775	-2.114	**
BOND*VOL	0.2229	0.419		BOND*VOL	0.3887	0.877	
SLOPE	-0.0166	-0.313		SLOPE	-0.0094	-0.196	
CA*SLOPE	0.0176	0.370		CA*SLOPE	-0.0176	-0.369	
BULLET*SLOPE	-0.0836	-1.560		BULLET*SLOPE	-0.0764	-1.595	
SIZE	0.0450	1.013		SIZE	0.0127	0.375	
LIFE	0.1365	1.865	*	LIFE	0.1509	1.850	*
TIME	0.0145	2.658	***	TIME	0.0193	4.899	***
CSPR	0.5025	6.355	***	CSPR	0.5057	5.174	***
IP	-0.0160	-1.865	*	IP	-0.0155	-1.766	*
CA*IP	-0.0001	-0.009		CA*IP	-0.0003	-0.020	
BULLET*IP	0.0140	0.683		BULLET*IP	0.0138	0.864	
RATE:				RATE:			
Aa1/Aa2	0.3330	3.541	***	Aa1/Aa2	0.2713	4.258	***
Aa3/A1	0.5007	4.373	***	Aa3/A1	0.4470	4.660	***
COLLAT:				COLLAT:			
Credit Card Retail	0.0928	1.007		Credit Card Retail	0.1233	1.333	
Auto/Truck	0.0656	1.106		Auto/Truck	0.0735	1.485	
Home Equity	0.4028	3.647	***	Home Equity	0.3736	4.181	***
Manf Hous/Mobile Hm	0.1461	1.078		Manf Hous/Mobile Hm	0.0553	0.451	
Misc Commerc	0.1929	0.985		Misc Commerc	0.2301	1.153	
Misc Retail	0.2574	2.342	**	Misc Retail	0.2281	2.440	**
INSURE (Specific):				INSURE (Grouped):			
Outside Provided on A:				Tot Ins Outside on A (log)	0.0541	2.528	**
Sub Percent Sold (log)	0.0427	1.371					
Outside Guar on A (log)	0.0782	4.067	***				
Outside LOC on A (log)	0.0831	2.717	***				
Cash Coll on A, Outside (log)	0.0154	0.361					
Outside Provided on B:				Tot Ins Outside on B (log)	-0.0370	-1.588	
Outside Guar on B (log)	-0.0802	-2.432	**				
Outside LOC on B (log)	0.0220	0.664					
Cash Coll on B, Outside (log)	0.0379	1.137					
Inside Provided on A:				Tot Ins Inside on A (log)	0.0160	0.562	
Sub Percent Retained (log)	0.0697	1.754	*				
Inside Guar on A (log)	-0.1065	-1.378					
Inside LOC on A (log)	0.0363	0.823					
Cash Coll on A, Inside (log)	0.0220	0.511					
Reserve/Spread Account on A (log)	-0.0382	-1.370					
Overcollat as Only Credit Enhance (log	0.0773	1.856	*				
Inside Provided on B:				Tot Ins Inside on B (log)	-0.0187	-0.804	
Inside Guar on B (log)	-0.0166	-0.539					
Cash Coll on B, Inside (log)	-0.0001	-0.003					
Reserve/Spread Account on B (log)	0.0147	0.428					
	N = 219				N = 219		
Ommitted: Aaa, Pass-thru	DEP MEAN = 1.12828				DEP MEAN = 1.12826		
	ADJ R SQUARE = 0.5874				ADJ R SQUARE = 0.5625		
	F = 8.959				F = 11.379		

CHAPTER 7
CONCLUSION

This study has provided a detailed examination of the nonmortgage asset-backed security market. In addition to describing the institutional details of the securities and the market, a new dataset was created of issue prices and characteristics in order to test the ABS pricing determinants. In general, ABS pricing at issue is rational. Spreads reflect premiums for default risk, interest rate and reinvestment risk, and discounts for marketability. Despite the fact that the ABS market is new and maturing, there does not appear to be any narrowing of spreads over time for individual originators or homogeneous securities. There is an aggregate widening of spreads over time apparently reflecting market recomposition, new entrants, and new collateral types. Homogeneous securities show no such general trend, however. The perception that spreads have narrowed over time is not supported. The public market does require premiums for newness and discounts for experience, although new collateral does not require a premium, echoing Tufano's (1989) findings on financial innovations.

Prepayment risk is a less serious problem with ABSs than for mortgage-backed securities. This is because the expected lives of most ABS tranches are much shorter than those of MBS and there is less incentive to refinance. But prepayment risk is clearly a strong factor in the pricing of subordinate tranches, not surprising because the subordinate classes face a higher pro-rata share of this risk. There is also suggestive evidence that

prepayment default risk may be a concern. The effect is difficult to establish because the proxy for default risk is quite broad.

Finally, investors clearly require information about pool quality or issue structure beyond that contained in a tranche credit rating. Originator rating is important, institutional type matters, and so does the type and amount of credit enhancement. These results are consistent with two non-mutually exclusive hypotheses: (1) Credit rating is an insufficient statistic for default risk, or (2) the quality of a pool or structure is important beyond default risk because it is more probable that a low quality pool will lead to future interruptions or changes in expected cash flows.

Implications of the Analysis

The results found in this study have implications for investors, rating agencies, and bank regulators. ABSs are very complicated securities that obviously are best understood by sophisticated investors. As the market expands, there may be pressure to sell these securities to less knowledgeable investors. For example, in June of 1989 Citicorp issued a $500 million credit card backed issue targeted to small retail investors. The underwriter, Merrill Lynch, solicited retail investors to purchase $1,000 certificates, called "plastic bonds." These certificates had an expected four year life and an expected 9.14% yield, only 16 basis points more than a four year FDIC insured Citicorp CD (Nathans, 1989). A few other issues have since also targeted retail investors. These investors may not be able to fully estimate or understand the risks of these securities. They may be making a mistake if they depend merely on the tranche credit rating.

The results here find that investors are utilizing much information beyond the credit rating of the tranche. Investors are being exposed to more risk than the credit rating would indicate. There are legal risks and many sources of structural failure. Thus rating agencies may want to consider more when assigning a rating, particularly the possibility of early amortization events occurring and other timing effects resulting from weak links in the ABS issue structure. It might be that these issues require two ratings. S&P already does this when requested; the second rating is on the underlying issuer and structure and represents the risk to the insurer. These are "used in the analysis of portfolio risk and capital adequacy of the insurer or guarantor" (Griep, 1993, p. 144). Such dual ratings may be expanded.

Because the originating and servicing roles do matter to pricing, investors must be aware of the concentration risk they take on when investing in securities where these two roles are assumed by the same entity. The risk is compounded when the originator also assumes the credit enhancement role. It may be conjectured that the market would, in fact, accept a lower expected return if these roles are separated.

Investors should reduce this concentration risk as well as prepayment risk and liquidity risk by diversifying across ABSs. This may apply especially to banks that invest in ABSs. Regulators should be aware that banks may be exposed to significant additional risk if they are exposed to this concentration risk without sufficient diversification.[1]

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[1]Regulators do not treat ABSs as substitutes for mortgage-backed securities. Currently ABSs are weighted 100% for risk based capital adequacy. This group includes the residual MBS tranches as well as extremely interest-sensitive "stripped" tranches like IO (interest only) tranches. Senior MBS are weighted from 0% to 50%.

Finally, this study could not confirm that the separation between originator and issuer is perceived by the market as complete. Thus, originators may face pressure to provide "moral recourse" for these issues. Moral recourse occurs when an originator, although not legally obligated, feels compelled to repurchase deteriorating or nonperforming assets. This is especially important to a regulated industry like banking. Moral recourse is an off-balance sheet risk, one regulators should carefully analyze.

Extensions of the Pricing Analysis

This study marks only an initial exploration of ABS pricing. Much more needs to be done to develop an understanding of the role and value of these securities and the securitization process. The sample here considered only primary market issues of public securities. More needs to be known about the private market for ABSs and complementary markets such as ABS commercial paper conduits if we are to more fully understand the role securitization plays both for sellers and investors.

With such complex and innovative issues, the role of the underwriter is surely important in pricing. Issues such as underwriter reputation may more fully explain the pricing of primary market ABSs. Seasoning effects on these issues will be of interest, especially in light of the extensive work on corporate bond seasoning. Secondary market pricing and liquidity are also important areas of exploration. This is especially important in light of recent CMO performance which saw spreads approaching 10% of principal on some volatile tranches.[2] How stable are ABSs in the aggregate in the face of significant

[2]Jereski, 1994. Note that a normal agency pass-through has a bid-ask spread between 1/32 and 4/32 of 1% (Fabozzi and Modigliani, 1992). The authors are talking of MBS in general--Ginnie Mae, Freddie Mac, and Fannie Mae.

events such as credit enhancer downgrades, early amortization events, fraud, or default? In other words, is there a contagion effect in this market? A cross-sectional time series of secondary market prices will be required to evaluate this issue.

Finally, how does the pricing translate to possible cost savings for the selling firm? Benston's (1992) view is that when all costs are considered, securitization is little more than a zero-sum game. But others believe that a lower "blended yield" or "weighted average interest rate" results when cash flows are partitioned (Rosenthal and Ocampo, 1988, p. 55). Boot and Thakor (1993) present a model in which pooling assets and partitioning cash flows maximize firm revenue. Documenting the savings, if any, for the selling firm will be difficult, but such research will add to the existing loan sale literature on the motivations for securitization. One possible research method that begins to delve into this subject is a logit or probit analysis of the probability of securitizing assets based on firm risk and profitability factors.

APPENDIX A
ABS GLOSSARY

Asset-backed security (ABS): a security whose cash flows are backed by a specific pool of loans or receivables. The ABSs considered here are differentiated from mortgage-backed securities (MBSs)--the collateral is often nonmortgage consumer loans and the securities are privately insured.

Bankruptcy remote: the separation of the risks of the originator from the risks of the pool of assets backing an ABS. It involves a special purpose vehicle to purchase the assets and issue the securities.

Bullet: a cash flow structure which is a refinement of the controlled amortization structure. It implies a stated date where principal is scheduled to be paid off all at once. Principal payments received by the SPV before this date are invested in high quality short-term investments until the expected maturity date.

Captive finance company: consumer finance arms of automobile and mobile home manufacturers and retail businesses.

Cash collateral account: a form of credit enhancement; an amount equal to a predetermined percentage of principal is maintained as a separate cash account as a first loss protection for investors.

Collateral: The loans or receivables underlying an ABS.

Controlled amortization: a cash flow structure with an initial revolving period of uniform interest-only payments, followed by an amortization period of preset length where interest and principal are paid to investors until the principal is paid off.

Convexity: Refers to the price-yield relationship of a security. An option-free bond, for example, exhibits negative convexity. As required yield falls, price rises, but more than a negative linear relation would suggest. When required yield rises, price falls, but less than a linear relation suggests. This price-yield curve is convex. A mortgage or mortgage-backed security exhibits positive convexity, because prices are capped due to the prepayment option of the borrower. That is, as interest rates fall, the value (price) of the security cannot rise much above the face value of principal remaining because that is what investors will receive if the option is exercised.

Credit enhancement: any additional protections for investors against default risk that are included in the structure of the issue. These include guarantees of principal and interest payments by third party insurers, senior/subordinate structures, and cash collateral accounts.

Credit securitization: the type of securitization that pools assets--such as mortgages, automobile loans, or credit card receivables--and creates new asset-backed securities collateralized by the pool of assets.

Early amortization event: a "trigger" event in controlled amortization or bullet structures which causes the security to immediately begin to amortize in the interest-only period as a protection of principal.

Expected average life: The expected average life is "the average time to receipt of principal payments (projected scheduled principal and projected principal prepayments), weighted by the amount of principal expected divided by the total principal to be repaid" (Fabozzi and Modigliani (1992, p. 273). The average life in years is:

$$average\ life = \frac{1}{12} \sum_{t=1}^{n} \frac{t\ (principal\ expected\ at\ time\ t)}{total\ principal}$$

where n is the number of months remaining.

GAAP (Generally Accepted Accounting Principles): the requirements that non-banks must follow to effect a true sale of assets. GAAP does allow sales with recourse. See RAP.

Letter of credit: A form of credit enhancement usually provided by a commercial bank, that assures investors principal up to some stated percentage of losses. With ABS, irrevocable, not standby, letters of credit are used.

Mezzanine: A tranche senior to a B tranche, but junior to an A. Mezzanines provide additional credit support to senior tranches.

Moral recourse: when an originator, although not required by contract, feels compelled to repurchase deteriorating or nonperforming assets.

Originator: The entity that originally books and sells the loans used in an ABS. The originator usually does not issue the securities, however. The collateral is first sold to an SPV.

Overcollateralization: A self-supporting form of credit enhancement. The value of the underlying assets exceeds the face value of the securities and thus provides a cushion for the security holders.

Pass-through: a cash flow structure that represents direct ownership in a portfolio of loans that are similar in term to maturity, interest rate, and quality. Investors receive principal and interest, less a servicing fee, as they are received by the servicer.

Prepayment risk: the risk that the investor who paid a premium for the ABS will receive a lower than expected return because of faster than expected repayment (generally occurring with a decline in interest rates), or that the investor who bought the ABS at a discount will receive a lower than expected return because of slower than expected prepayments.

Principal funding account: a reinvestment account used with controlled amortization and bullet cash flow structures whereby principal payments received before the amortization period are reinvested so as to make likely sufficient cash flow to make all principal payments during the amortization period. Similarly, if payments are slower than expected, the provider of the principal funding account advances funds to make necessary principal payments.

RAP (Regulatory Accounting Principles): The requirements that banks must follow to effect a true sale of assets and remove the assets from the balance sheet. These rules are more stringent regarding recourse than GAAP.

Securitization: the transformation of private loans negotiated between a borrower and lender into publicly traded (or at least saleable) securities. It separates the originator from the ultimate investor.

Senior-subordinate structure: a self-supporting form of credit enhancement. A subordinate (B) tranche provides support for the senior (A) tranches by absorbing the first losses of principal. The subordinate tranche can be retained or sold.

Sequential-pay classes: The ABS issue is divided into a number of different maturity classes, whereby the first (shortest maturity) class receives the first installments of principal payments and any prepayments until class 1 bonds are paid off. Then these payments go to class 2, and so on.

Servicer: most often the originator, the servicer is responsible for collecting interest and principal payments on the assets in the underlying pool and transmitting these funds to the investors.

Soft-bullet: a variation on the bullet structure; principal is paid off over a short period near the expected maturity date, thus giving the issuer some flexibility.

Special purpose vehicle or entity (SPV/SPE): a trust or specially chartered corporation which purchases the loans (collateral) from the originator and is the actual issuer of the asset-backed securities. The SPV thus separates the risks of the pool of collateral from

the originator, the so-called "bankruptcy remote" feature.

Spread account: also referred to as a reserve account. A form of credit enhancement. It is simply a type of escrow account for the spread between collateral payments and the payments to the investors, less a servicing fee. The funds in this spread account provide credit support for the asset-backed securities. After the securities are completely paid off, anything left in the spread account will revert to the originator.

Subordinate class: Also called a B tranche; a class or classes of securities with lower priority to principal and interest payments than senior or A tranches. As such, subordinate classes absorb first losses and provide credit support for senior classes.

Surety bond: a form of credit enhancement provided by a third party insurance firm; a financial guarantee placed on the ABS notes or certificates to provide for payment of principal on the defaulted assets or securities.

Surety wrap: a guaranty of principal and interest on both A (the senior) and B (the subordinate) pieces.

Tranche: also referred to as a class. A part of an issue that shares documentation with other parts (i.e. one prospectus) but has different terms (i.e. different expected average lives, different yields, different principal amount, etc.).

APPENDIX B
REGRESSION TERMS AND ABBREVIATIONS

Dependent Variables:

Absolute spread: The difference between the expected yield on the ABS tranche and a Treasury bill/bond with a maturity equal to the expected average life of the ABS. This Treasury yield is obtained by linear interpolation. Used in the primary regressions.

Relative spread: The absolute spread divided by the interpolated Treasury yield. Used in regressions presented in Appendix C.

Independent Variables:

I: Interest rate level, five year constant maturity Treasury bond on the day of issue.

VOL: Interest volatility, the standard deviation of the annualized yield of the five year constant maturity Treasury for a period 30 days before issue date.

Volatility-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

CA*VOL: Dummy for Controlled Amortization structure times VOL. The incremental effect of Controlled amortization on VOL.

BULLET*VOL: Dummy for Bullet structure times VOL. The incremental effect of Bullet on VOL.

BOND*VOL: Dummy for Bond structure times VOL. The incremental effect of Bond on VOL.

SLOPE: the slope of the term structure calculated as the difference between the yield on the 5 year constant maturity Treasury and the six month Treasury bill.

Slope-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

CA*SLOPE: Dummy for Controlled Amortization structure times SLOPE. The incremental effect of Controlled amortization on SLOPE.

BULLET*SLOPE: Dummy for Bullet structure times SLOPE. The incremental effect of Bullet on SLOPE.

BOND*SLOPE: Dummy for Bond structure times SLOPE. The incremental effect of Bond on SLOPE.

SIZE: The dollar size of the issue, logged, a proxy for liquidity.

LIFE: Expected average life, logged, measured in years.

TIME: A numeraire to indicate time trend for market, measured by a quarter count with one being the first quarter of 1985.

CSPR: The corporate bond spread between Baa and AAA, a control variable for the time varying price of risk.

IP: The state of the economy, represented by the previous six month percentage change in the index of industrial production.

IP (Economic Condition)-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

CA*IP: Dummy for Controlled Amortization structure times IP. The incremental effect of Controlled amortization on IP.

BULLET*IP: Dummy for Bullet structure times IP. The incremental effect of Bullet on IP.

BOND*IP: Dummy for Bond structure times IP. The incremental effect of Bond on IP.

RATE: Dummy (1,0) variables for the issue's credit rating, a proxy for default risk. The higher of either Moody's or S&P is used, if there is a conflict. Aaa is the omitted rating (captured in the intercept). Rating groups are Aa1/Aa2, Aa3/A1, A2, and A3 and lower.

COLLAT: Dummy (1,0) variables for the type of underlying asset of the issue. The sample is divided into 8 groups, with credit card receivables the omitted group. The dummy categories are credit card retail, auto/truck loans, home equity loans, manufactured housing/mobile home loans, miscellaneous commercial, and miscellaneous retail.

FIRST: Two dummy (1,0) variables to indicate the first issue for an originator or the first use of a type of collateral.

CALL: Dummy (1,0) variable with 1 indicating some type of call provision.

FREQ: Dummy (1,0) variables signifying interest and/or principal payment frequency. 12 is the omitted frequency. Dummies are for 2 and 4 times per year.

BDUM: Dummy (1,0) variable to indicate that the tranche is a subordinate B tranche.

B Tranche Interactives:

Volatility-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

BDUM*VOL: Dummy for B tranche times VOL. The incremental effect of a B pass-through on VOL.

CA*BDUM*VOL: Dummy for B tranche times CA*VOL. The incremental effect of B controlled amortization on VOL + CA*VOL.

BULLET*BDUM*VOL: Dummy for B tranche times BULLET*VOL. The incremental effect of B bullet on VOL + BULLET*VOL.

BOND*BDUM*VOL: Dummy for B tranche times BOND*VOL. The incremental effect of B bullet on VOL + BOND*VOL.

Slope-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

BDUM*SLOPE:	Dummy for B tranche times SLOPE. The incremental effect of a B pass-through on SLOPE.
CA*BDUM*SLOPE:	Dummy for B tranche times CA*SLOPE. The incremental effect of B controlled amortization on SLOPE + CA*SLOPE.
BULLET*BDUM*SLOPE:	Dummy for B tranche times BULLET*SLOPE. The incremental effect of B bullet on SLOPE + BULLET*SLOPE.
BOND*BDUM*SLOPE:	Dummy for B tranche times BOND*SLOPE. The incremental effect of B bullet on SLOPE + BOND*SLOPE.

IP (Economic Condition)-Cash Flow Structure Interactives:

Pass-through is the omitted cash flow structure.

BDUM*IP:	Dummy for B tranche times IP. The incremental effect of a B pass-through on IP.
CA*BDUM*IP:	Dummy for B tranche times CA*IP. The incremental effect of B controlled amortization on IP + CA*IP.
BULLET*BDUM*IP:	Dummy for B tranche times BULLET*IP. The incremental effect of B controlled amortization on IP + BULLET*IP.
BOND*BDUM*IP:	Dummy for B tranche times BOND*IP. The incremental effect of B controlled amortization on IP + BOND*IP.

MULTA: Dummy (1,0) variable to indicate that the tranche is an A tranche in an issue with multiple A tranches.

REP: Reputation of the originator, proxied by the log of the total dollar value of public ABS issues previous to the current issue.

ORIGRT: Dummy (1,0) variables for the senior bond rating of the originator. Originators were divided into five groups: Aaa to Aa3 (omitted), A1 to A3, Baa1 to Baa3, Ba1 to Ba3, and B1 to Caa1.

ORIGTP: Originator type. Dummy (1,0) variables for the type (bank, thrift, non-bank financial, captive finance company, other). Banks are the omitted group.

INSURE: A vector of 13 credit enhancement variables, as logged percentages of total issue, capturing the various types of enhancement available.

Sub Percent Sold: Credit enhancement of A tranche(s) resulting from a sold subordinate tranche expressed as a percentage (logged) of issue principal.

Outside Guar on A: Credit enhancement of A tranche(s) resulting from a guaranty by a third party insurer expressed as a percentage (logged) of issue principal.

Outside LOC on A: Credit enhancement of A tranche(s) resulting from a Letter of Credit from a third party expressed as a percentage (logged) of issue principal.

Cash Coll on A, Outside: Credit enhancement of A tranche(s) resulting from a Cash Collateral account provided by a third party expressed as a percentage (logged) of issue principal.

Outside Guar on B: Credit enhancement of B tranche(s) resulting from a guaranty by a third party insurer expressed as a percentage (logged) of issue principal.

Outside LOC on B: Credit enhancement of B tranche(s) resulting from a Letter of Credit from a third party expressed as a percentage (logged) of issue principal.

Cash Coll on B, Outside: Credit enhancement of B tranche(s) resulting from a Cash Collateral account provided by a third party

	expressed as a percentage (logged) of issue principal.
Sub Percent Retained:	Credit enhancement of A tranche(s) resulting from a retained (by originator) subordinate tranche expressed as a percentage (logged) of issue principal.
Inside Guar on A:	Credit enhancement of A tranche(s) resulting from a guaranty by the originator expressed as a percentage (logged) of issue principal.
Inside LOC on A:	Credit enhancement of A tranche(s) resulting from a Letter of Credit from the originator (or parent) expressed as a percentage (logged) of issue principal.
Cash Coll on A, Inside:	Credit enhancement of A tranche(s) resulting from a Cash Collateral account provided by the originator expressed as a percentage (logged) of issue principal.
Reserve/Spread Account on A:	Credit enhancement of A tranche(s) resulting from a spread account established by the originator expressed as a percentage (logged) of issue principal.
Overcollat as Only Credit Enhancement:	Credit enhancement of A tranche(s) resulting from overcollateralization expressed as a percentage (logged) of issue principal.
Inside Guar on B:	Credit enhancement of B tranche(s) resulting from a guaranty by the originator expressed as a percentage (logged) of issue principal.
Cash Coll on B, Inside:	Credit enhancement of B tranche(s) resulting from a Cash Collateral account provided by the originator expressed as a percentage (logged) of issue principal.

Reserve/Spread Account on B:	Credit enhancement of B tranche(s) resulting from a spread account established by the originator expressed as a percentage (logged) of issue principal.

APPENDIX C
RELATIVE SPREAD REGRESSIONS

Following are the regressions using relative spread as the dependent variable.

TABLE 17: DETERMINANTS OF ABS RELATIVE SPREADS
OLS REGRESSIONS (DEPENDENT VARIABLE = RELATIVE YIELD SPREAD)

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	0.0079	0.219	
VOL	0.1394	3.380	***
CA*VOL	-0.0429	-0.925	
BULLET*VOL	-0.0927	-1.512	
BONO*VOL	-0.2012	-2.216	**
SLOPE	0.0234	5.454	***
CA*SLOPE	-0.0197	-3.271	***
BULLET*SLOPE	-0.0218	-3.988	***
BONO*SLOPE	-0.0715	-1.443	
SIZE	-0.0035	-0.948	
LIFE	-0.0212	-2.959	***
TIME	0.0039	7.410	***
CSPR	0.0058	3.015	***
IP	-0.0036	-2.196	**
CA*IP	0.0024	1.153	
BULLET*IP	0.0054	1.733	*
BONO*IP	0.0483	1.655	*
RATE:			
Aa1/Aa2	0.0630	5.693	***
Aa3/A1	0.0534	2.909	***
A2	0.0276	1.497	
A3 and lower	0.1625	3.527	***
COLLAT:			
Credit Card Retail	0.0076	0.974	
Auto/Truck	-0.0042	-0.572	
Home Equity	0.0559	4.894	***
Manf Hous/Mobile Hm	-0.0045	-0.308	
Misc Commerc	0.0253	1.616	
Misc Retail	0.0154	1.570	
FIRST:			
First Issue	0.0090	1.254	
First Collateral	-0.0060	-0.324	
CALL	-0.0111	-1.290	
FREQ:			
Pmts 4 X Yr	-0.0004	-0.038	
Pmts 2 X Yr	-0.0001	-0.020	
BOUM	0.0354	1.978	**
MULTA	0.0098	0.956	

N = 452
DEP MEAN = 0.17657
ADJ R SQUARE = 0.6640
F = 28.01
*** , **, * = SIGNIFICANT AT 1%, 5%, 10%.

OMITTED: Aaa, Credit Card, Pass-Thru

TABLE 18: DETERMINANTS OF ABS RELATIVE SPREADS
EFFECT OF B INTERACTIVES

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	0.0182	0.520	
VOL	0.1220	3.115	***
CA*VOL	-0.0341	-0.797	
BULLET*VOL	-0.0842	-1.389	
BOND*VOL	-0.1714	-2.005	**
SLOPE	0.02B2	5.985	***
CA*SLOPE	-0.0202	-3.268	***
BULLET*SLOPE	-0.0287	-4.476	***
BOND*SLOPE	-0.0734	-1.834	
SIZE	-0.0037	-1.085	
LIFE	-0.0213	-2.880	***
TIME	0.0039	7.387	***
CSPR	0.0052	2.817	***
IP	-0.0029	-1.753	*
CA*IP	0.0025	1.192	
BULLET*IP	0.0063	1.845	*
BOND*IP	0.0477	1.738	*
RATE:			
Aa1/Aa2	0.0653	8.383	***
Aa3/A1	0.0448	2.831	***
A2	0.0588	3.378	***
A3 and lower	0.1962	3.938	***
COLLAT:			
Credit Card Retail	0.0046	0.598	
Auto/Truck	-0.0065	-0.958	
Home Equity	0.0527	5.129	***
Manf Hous/Mobile Hm	-0.0046	-0.362	
Misc Commerc	0.0249	1.657	*?
Misc Retail	0.0144	1.534	
FIRST:			
First Issue	0.0088	1.240	
First Collateral	-0.0085	-0.473	
CALL	-0.0173	-2.323	**
FREQ:			
Pmts 4 X Yr	0.0019	0.178	
Pmts 2 X Yr	0.0048	0.813	
BOUM	-0.0569	-1.736	*
BDUM*VOL	0.8999	3.883	***
CA*BDUM*VOL	-0.3881	-1.124	
BULLET*BDUM*VOL	-0.58B6	-2.9B1	***
BDUM*SLOPE	-0.0224	-1.818	
CA*BOUM*SLOPE	0.0180	0.681	
BULLET*BDUM*SLOPE	0.0515	3.723	***
BDUM*IP	-0.0118	-2.191	**
CA*BDUM*IP	0.0128	1.535	
BULLET*BDUM*IP	-0.0055	-0.697	

N = 447
DEP MEAN = 0.17591
ADJ R SQUARE = 0.6742
F = 23.511

*** = SIGNIFICANT AT 1%.
** = SIGNIFICANT AT 5%.
* = SIGNIFICANT AT 10%.
Omitted: A class, Aaa RATE, Credit Card, Pass-thru

TABLE 19: DETERMINANTS OF ABS RELATIVE SPREADS
EFFECT OF REPUTATION AND ORIGINATOR RATE

	REPUTATION			ORIGINATOR RATE VARIABLES		
VARIABLE	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	0.0126	0.406		0.0046	0.146	
VOL	0.0990	2.688	***	0.1115	3.123	***
CA*VOL	-0.0190	-0.477		-0.0236	-0.506	
BULLET*VOL	-0.0528	-0.933		-0.1524	-2.983	***
BONO*VOL	-0.1553	-1.867	*			
SLOPE	0.0256	6.057	***	0.0217	4.297	***
CA*SLOPE	-0.0206	-3.454	***	-0.0221	-3.555	***
BULLET*SLOPE	-0.0258	-4.423	***	-0.0167	-3.241	***
BONO*SLOPE	-0.0722	-1.449				
SIZE	-0.0031	-1.021		-0.0009	-0.334	
LIFE	-0.0211	-3.071	***	-0.0194	-3.107	***
TIME	0.0042	8.477	***	0.0034	7.966	***
CSPR	0.0057	3.091	***	0.0064	3.665	***
IP	-0.0030	-1.833	*	-0.0046	-2.572	**
CA*IP	0.0030	1.453		0.0044	2.144	**
BULLET*IP	0.0057	1.751	*	0.0052	1.635	
BONO*IP	0.0482	1.610				
RATE:						
Aa1/Aa2	0.0655	8.758	***	0.0453	4.138	***
Aa3/A1	0.0484	3.390	***	0.0315	2.041	**
A2	0.0598	3.485	***	0.0489	2.260	**
A3 and lower	0.1954	3.954	***	0.1997	2.551	**
COLLAT:						
Credit Card Retail	0.0041	0.526		-0.0004	-0.054	
Auto/Truck	-0.0050	-0.805		-0.0044	-0.839	
Home Equity	0.0530	5.116	***	0.0354	3.561	***
Manf Hous/Mobile Hm	-0.0041	-0.335		0.0165	1.065	
Misc Commerc	0.0252	1.751	*	0.0281	2.312	**
Misc Retail	0.0140	1.536		0.0188	1.749	*
BOUM	-0.0602	-1.653	*	-0.0762	-2.166	**
BOUM*VOL	0.6612	3.660	***	1.0790	4.933	***
CA*BOUM*VOL	-0.3533	-1.026		-0.4066	-1.105	
BULLET*BOUM*VOL	-0.5188	-2.628	***?	-0.5693	-2.573	**?
BOUM*SLOPE	-0.0192	-1.438		-0.0126	-0.722	
CA*BOUM*SLOPE	0.0155	0.597		0.0114	0.334	
BULLET*BOUM*SLOPE	0.0449	3.458	***	0.0434	2.813	***
BOUM*IP	-0.0114	-2.067	**	-0.0150	-2.324	**
CA*BOUM*IP	0.0128	1.551		0.0206	1.567	
BULLET*BOUM*IP	-0.0026	-0.333		0.0013	0.151	
REP	-0.0012	-1.576				
ORIG RATE: A1-A3				0.0031	0.346	
ORIG RATE: Baa1-Baa3				-0.0031	-0.361	
ORIG RATE: Ba1-Ba3				-0.0138	-1.205	
ORIG RATE: B1-Caa1				0.0300	1.326	
	N = 452			N = 312		
	DEP MEAN = 0.17657			DEP MEAN = 0.16305		
	ADJ R SQUARE = 0.6766			ADJ R SQUARE = 0.7403		
	F = 28.738			F = 24.961		

Ommittad: Aaa, Credit Card, Pass-thru, Orig Rate Aa3 and up

TABLE 20: DETERMINANTS OF ABS ABSOLUTE SPREAD
PANELS BY COLLATERAL WITH ORIGINATOR TYPE (A TRANCHES ONLY)

	COLLATERAL: CREDIT CARDS			COLLATERAL: AUTO/TRUCK LOANS			COLLATERAL: HOME EQUITY		
VARIABLE	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	-0.0241	-0.873		-0.0258	-0.775		-0.8525	-8.722	***
VOL	0.0788	0.939		0.1261	3.984	***	-0.0736	-0.454	
CA*VOL	-0.0783	-1.038		0.0118	0.181		-0.5730	-2.878	***
BULLET*VOL	-0.1831	-2.270	**	0.0177	0.413				
BOND*VOL				-0.0112	-0.238				
SLOPE	0.0487	7.054	***	0.0188	3.048	***	-0.1218	-5.428	***
CA*SLOPE	-0.0483	-6.444	***	-0.0044	-0.332				
BULLET*SLOPE	-0.0455	-6.065	***	-0.0328	-4.365	***			
BOND*SLOPE				-0.1039	-3.505	***			
SIZE	0.0064	1.355		0.0015	0.488		-0.0078	-0.870	
LIFE	0.0025	0.408		0.0013	0.068		-0.0346	-1.415	
TIME	0.0005	0.966		0.0047	4.850	***	0.0505	8.908	***
CSPR	0.0083	6.015	***	0.0044	1.885	*	0.0008	0.088	
IP	-0.0208	-4.485	***	-0.0042	-2.018	**	-0.0128	-3.588	***
CA*IP	0.0180	3.856	***	0.0018	0.342				
BULLET*IP	0.0184	3.078	***	0.0168	3.040	***			
BOND*IP				0.0758	4.328	***			
RATE:									
Aa1/Aa2				0.0349	4.044	***	0.1358	4.209	***
ORIGTP:									
Thrift Originator	0.0383	8.121	***	-0.0137	-1.288				
Finance Co. Orig	0.0088	1.528		0.0086	0.872		0.0138	1.296	
Captive Finance Co.	0.0898	8.528	***	-0.0174	-1.835	*	0.0364	1.323	
Other Originator				-0.0254	-1.835	*			
	N = 98			N = 137			N = 52		
	OEP MEAN = 0.12358			OEP MEAN = 0.18034			OEP MEAN = 0.25882		
	ADJ R SQUARE = 0.6400			ADJ R SQUARE = 0.5578			ADJ R SQUARE = 0.7271		
	F = 11.557			F = 9.168			F = 13.35		

OMITTED DUMMIES: Aaa Issue Rating, Pass-through structure, Bank Originator.

TABLE 21: DETERMINANTS OF ABS RELATIVE SPREADS
EFFECT OF CREDIT ENHANCEMENT VARIABLES (A TRANCHES ONLY)

SPECIFIC CREDIT ENHANCEMENT VARIABLES

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	-0.090125	-1.563	
VOL	0.166818	2.025	**
CA*VOL	-0.127052	-1.251	
BULLET*VOL	-0.099736	-0.961	
BOND*VOL	-0.10376	-1.035	
SLOPE	0.025114	3.304	***
CA*SLOPE	-0.012188	-1.240	
BULLET*SLOPE	-0.027665	-3.128	***
SIZE	0.00699	0.956	
LIFE	-0.018036	-1.245	
TIME	0.004792	4.420	***
CSPR	0.002846	1.025	
IP	-0.003174	-1.634	
CA*IP	0.001395	0.501	
BULLET*IP	0.002574	0.750	
RATE:			
Aa1/Aa2	0.04891B	2.661	***
Aa3/A1	0.081957	3.552	***
COLLAT:			
Credit Card Retail	0.008333	0.550	
Auto/Truck	-0.01B745	-1.437	
Home Equity	0.043333	2.230	**
Manf Hous/Mobile Hm	-0.007631	-0.308	
Misc Commerc	-0.006241	-0.223	
Misc Retail	0.025562	1.254	
INSURE (Specific):			
Outside Provided on A:			
Sub Percent Sold (log)	0.009236	1.224	
Outside Guar on A (log)	0.019145	4.321	***
Outside LOC on A (log)	0.01846	2.567	**
Cash Coll on A, Outside (log)	0.004927	0.661	
Outside Provided on B:			
Outside Guar on B (log)	-0.011B85	-1.709	*
Outside LOC on B (log)	0.007425	0.950	
Cash Coll on B, Outside (log)	0.008029	1.262	
Inside Provided on A:			
Sub Percent Retained (log)	0.01B329	1.965	*
Inside Guar on A (log)	0.020613	1.812	
Inside LOC on A (log)	0.011279	1.392	
Cash Coll on A, Inside (log)	0.009101	1.028	
Reserve/Spread Account on A (log)	0.006194	0.622	
Overcollat as Only Credit Enhance (log)	0.022698	2.901	***
Inside Provided on B:			
Inside Guar on B (log)	0.002802	0.446	
Cash Coll on B, Inside (log)	0.002752	0.341	
Reserve/Spread Account on B (log)	0.002467	0.302	

N = 219
DEP MEAN = 0.18246
ADJ R SQUARE = 0.8177
F = 10.268

GROUPED CREDIT ENHANCEMENT VARIABLES

VARIABLE	COEFFICIENT	T STAT	SIGNIF
INTERCEPT	-0.0582	-1.173	
VOL	0.1544	1.815	*
CA*VOL	-0.0877	-0.715	
BULLET*VOL	-0.0942	-0.87B	
BOND*VOL	-0.1499	-1.535	
SLOPE	0.0260	3.775	***
CA*SLOPE	-0.0177	-1.890	*
BULLET*SLOPE	-0.0270	-3.556	***
SIZE	0.0032	0.589	
LIFE	-0.0135	-0.933	
TIME	0.0041	5.33B	***
CSPR	0.0026	0.899	
IP	-0.0027	-1.394	
CA*IP	0.0008	0.313	
BULLET*IP	0.0010	0.299	
RATE:			
Aa1/Aa2	0.0475	3.556	***
Aa3/A1	0.0703	3.351	***
COLLAT:			
Credit Card Retail	0.0153	0.934	
Auto/Truck	-0.0077	-0.72B	
Home Equity	0.0478	2.881	***
Manf Hous/Mobile Hm	-0.0175	-0.77B	
Misc Commerc	0.0081	0.288	
Misc Retail	0.0295	1.669	*
INSURE (Grouped):			
Tot Ins Outside on A (log)	0.0165	3.574	***
Tot Ins Outside on B (log)	-0.0052	-1.190	
Tot Ins Inside on A (log)	0.0139	2.383	**
Tot Ins Inside on B (log)	-0.0020	-0.394	

N = 219
DEP MEAN = 0.18246
ADJ R SQUARE = 0.6060
F = 13.894

OMITTED DUMMIES: Aaa Issue Rating, Pass-through structure

***, **, * = SIGNIFICANT AT 1%, 5%, 10%.

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BIOGRAPHICAL SKETCH

Richard H. Borgman received his Bachelor of Arts and Master of Arts degrees in English from Virginia Polytechnic Institute. His master's thesis was on the influence of film on the modern novel, particularly the use of film in the works of Malcolm Lowry. He later received a Master of Business Administration degree with a concentration in finance, also from Virginia Tech. Additional education includes completion of the Stanford University Publishing Summer Program and study abroad in Hungary, Yugoslavia, and East and West Germany of management practices, productivity, and the economic situation in 1987.

Mr. Borgman has taught English at Virginia Tech, was a general manager of a regional chain of bookstores, and was a product manager for Dominion Bankshares Corporation, headquartered in Virginia. He has lived in New York, Virginia, the U.S. Virgin Islands, and Florida. While attending the University of Florida's Ph.D. program in finance, he received the Graduate Council and the Grinter Fellowships. He is married with one daughter and one dog.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Graduate Faculty of the Department of Finance, Insurance and Real Estate in the College of Business Administration and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1994

Dean, Graduate School